PROCENTEC

User Manual

COMbricks

Monitoring, Networking and Control

PROFIBUS data hub for repeaters
Transparent for all PROFIBUS DP protocols
Drives 32 modules (10 repeater modules)
Hot swap
Powerful web server
ProfiTrace OE for monitoring 4 networks
2 GB SD card
100 Mbps Ethernet
12 Mbps PROFIBUS
DIN-rail
IP 20

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PROCENTEC

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Disclaimer of Liability
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Important Information

Purpose of the Manual
This user manual provides information how to work with COMbricks.

Recycling and Disposal
The parts of the COMbricks can be recycled. For further information about environment-friendly recycling and the procedure for disposing of your old equipment, please contact:

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1 Product description

1.1 Introduction

COMbricks™ - The first PROFIBUS and PROFINET-based automation system that unites network components, permanent monitoring with ProfiTrace and remote I/O.

COMbricks is a modular system that allows a mix of automation components on a backplane. Repeater modules can be inserted next to a PROFIBUS slave and at the same time, in a web browser over Ethernet, the condition of the installation can be remotely inspected with ProfiTrace OE.

1.2 Application areas

- ✓ Remote maintenance station with ProfiTrace OE
- ✓ Modular repeater backbone with hot swap
- ✓ Transparent data hub (repeaters, fibre optic, RS 485-IS, DP slave, etc.)

1.3 Product features

- ✓ Drives 32 modules (10 high-speed modules)
- ✓ Wide range of modules available
- ✓ Hot swap and extendible
- ✓ Powerful web server
- ✓ ProfiTrace OE for monitoring 4 networks
- ✓ DIN-rail mounting
- ✓ IP 20

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1.4 Modular PROFIBUS repeaters

The current trend with PROFIBUS projects is to use segmentation with repeaters, fibre optic and ProfiHubs to bridge the common faults of the end-user concerning his cabling difficulties. COMbricks adds another important element; the creation of modular and random repeater hubs that can be maintained remotely with a permanent internal ProfiTrace (see **Fig. 1**).

COMbricks is based on a backplane into which 10 hot swap repeater modules with 2 channels each can be inserted (20 galvanic isolated transparent segments). Every channel can handle 31 devices and maximum 1200 metres cable length (depends on the baudrate). **Fig. 2** illustrates some configurations.

Each channel has a fail safe circuit which ensures that the remainder of the PROFIBUS network continues to operate correctly and that the availability of the installation remains optimal.

The connection of the bus cable allows for a high degree of flexibility as the repeater modules contain both a 9-pin and screw connector.

It is possible to dynamically exchange equipment during operation. COMbricks is ideal for flow meters, pH analysers, actuators, drives and especially motor control centres that make use of drawer systems.

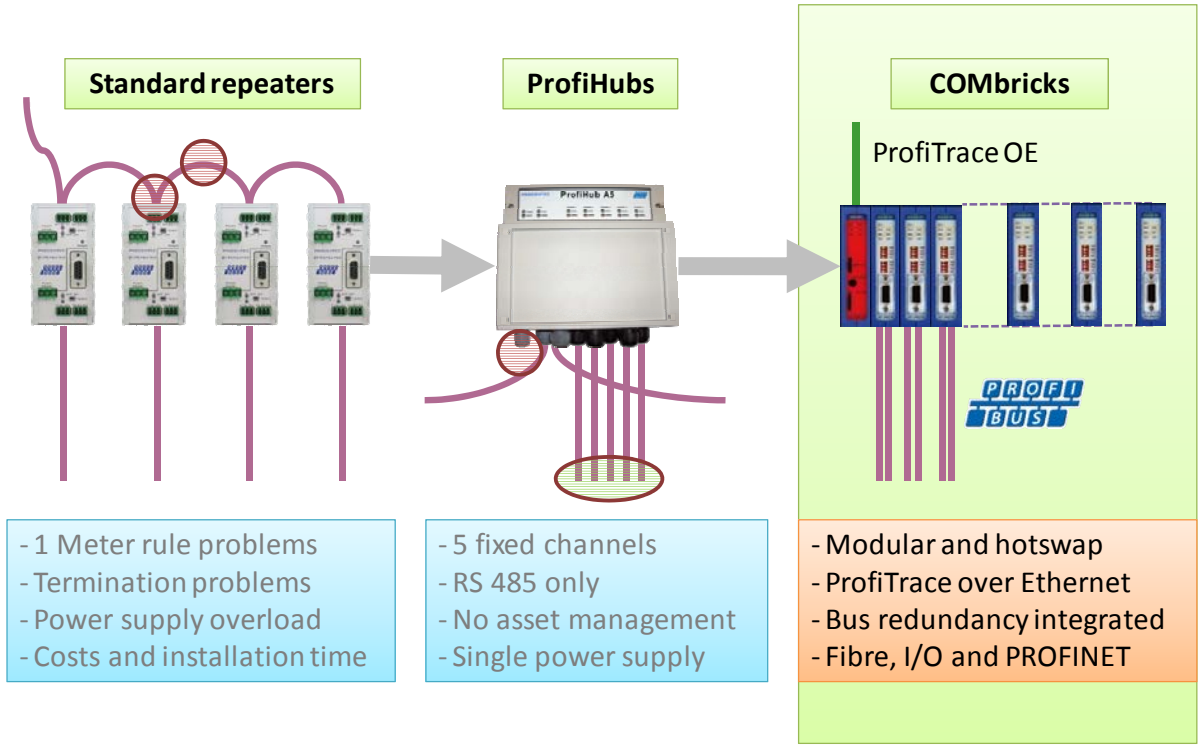

Fig. 1 - Latest trend in segmentation

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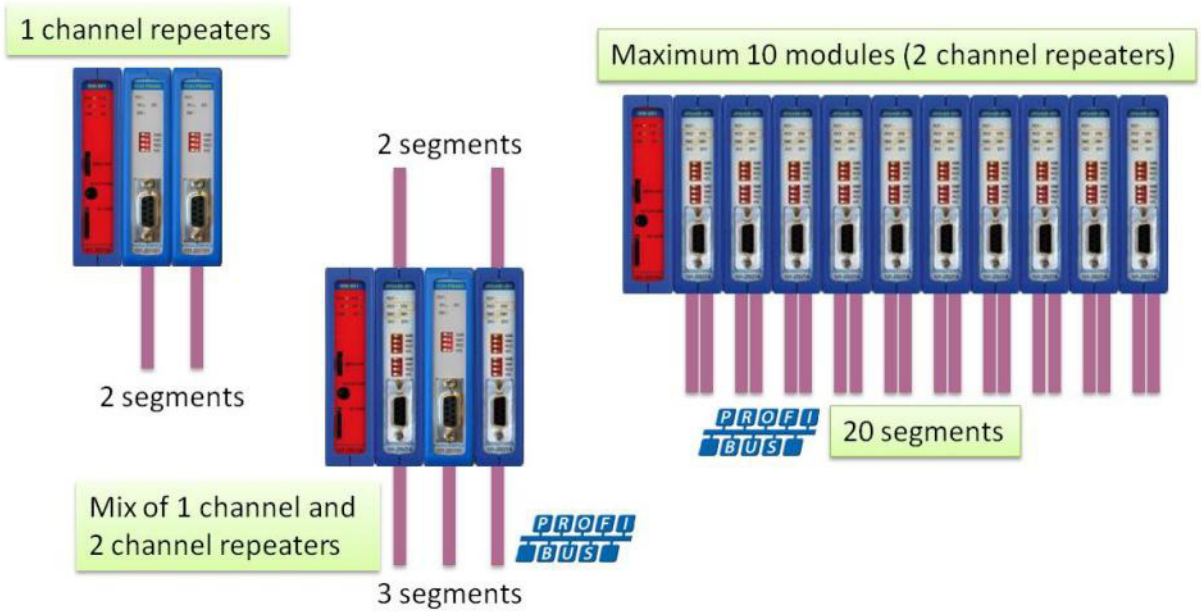

Fig. 2 - Repeater configuration examples

1.4.1 Redundancy

The bus redundancy technology of the repeater modules is very advanced. A redundant system can be built using 10 parallel cables. This architecture provides extremely high availability. Most suppliers only allow 2 cables (see **Fig. 3**).

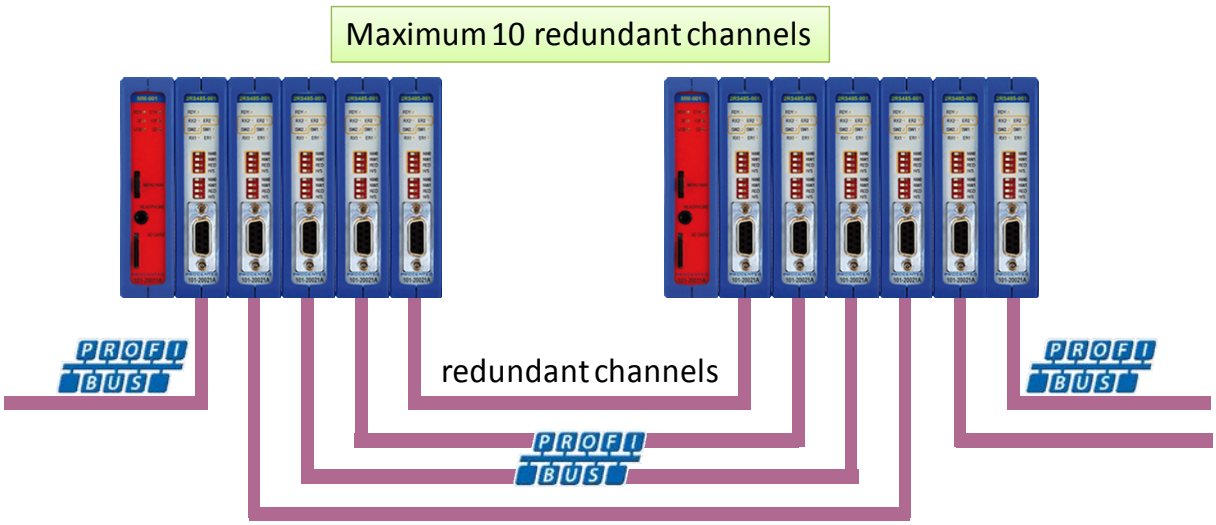

Fig. 3 - Redundancy configuration example

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1.4.2 Comparison between ProfiHub and COMbricks

ProfiHub A5 and B5 (simple)	COMbricks (flexible and high-tech)
- One component - PROFIBUS - RS 485 only - Easy installation - IP 65 version - Low cost	- Modular - Multi interface - Multi network - ProfiTrace OE - Asset management - Light weight

1.4.3 Typical applications

- Repeaters with permanent ProfiTrace
- Removable drives and motors
- Star, tree and bus structured networks
- Motor control centers (drawers)
- Redundancy for high availability
- EMC vulnerable applications
- Spur lines
- Isolator for sensitive devices

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1.5 ProfiTrace OE - Remote monitoring in a web browser

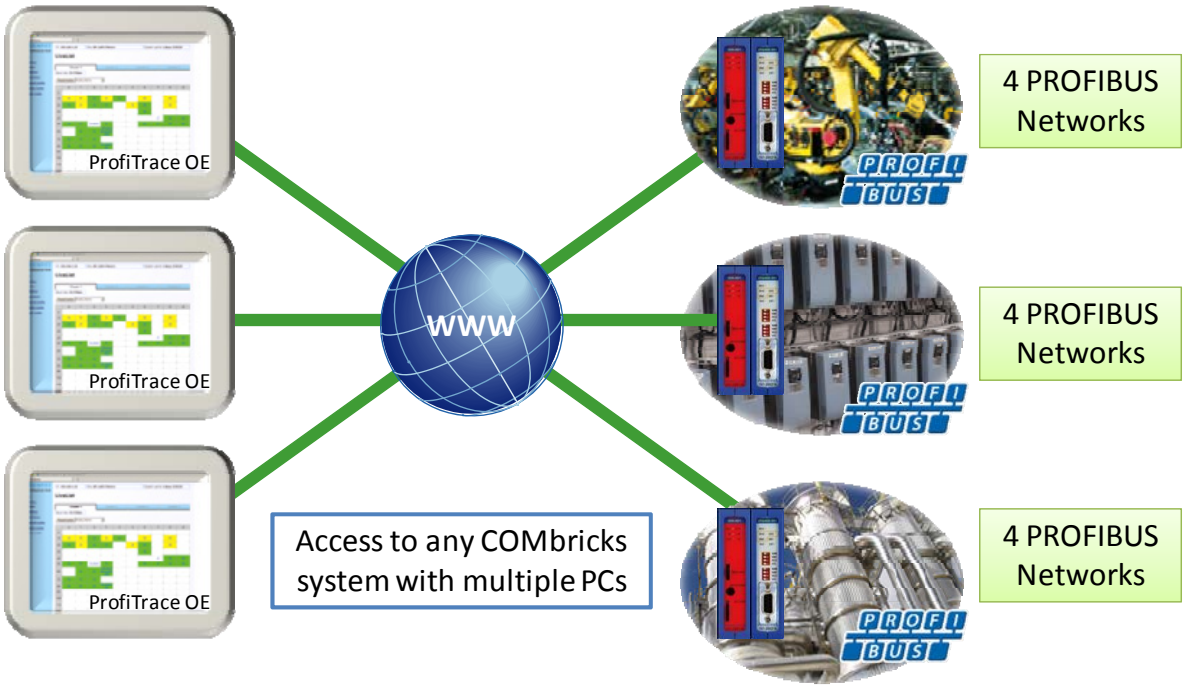
Permanent and simultaneous monitoring of 4 PROFIBUS networks is a powerful feature of COMbricks. Global projects and a shortage of (qualified) technical staff members are causing significant capacity problems. COMbricks offers a solution by remotely monitoring PROFIBUS installations over the Internet and alerting the user by email.

The user can simply connect surrounding PROFIBUS networks and every network can be set at a unique baudrate. The modular technology of COMbricks enables the network to be monitored when multiple repeater modules are installed. All transparent messages from the backplane are constantly analysed.

10 Repeater modules with 2 channels each (20 galvanic isolated segments in total) can be inserted into the backplane. Using DIP switches or the web server, repeater modules can be assigned to a network group, which ensures isolated communication from the repeaters that are assigned to different networks.

1.5.1 Web server

A web server with a ProfiTrace shell visualises the information in an understandable format (ProfiTrace OE). Because of the web browser, additional software is NOT required and a constant connection with a PC to the COMbricks is NOT necessary.



The monitoring and logging is performed by the repeater modules which are inserted in the backplane. COMbricks is the first system that has integrated the busmonitor in the network components. Deploying COMbricks repeaters for regular automation means an automatic availability of ProfiTrace OE.

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1.5.2 Email

Email messages provide real-time alerts should faults be detected in the PROFIBUS communication. These can be relatively easy to set up with the web server.

1.5.3 Device location detection

A brand new functionality within ProfiTrace OE is the device location detection. It gives a detailed overview on which repeater channel (segment) the devices are installed.

1.5.4 Comparison between COMbricks and ProfiTrace 2

The application area for COMbricks (ProfiTrace OE) compared to ProfiTrace 2 is completely different. ProfiTrace OE should be seen as a watchdog and ProfiTrace 2 as the mobile analyzer to do on-site work.

ProfiTrace 2 (*troubleshooting on-site*)	COMbricks (*watchdog*)
- USB (power supply) - Mobile - Software - C1 Master - Triggers and filters - Large file recording - Reporting - Fast - PROFIBUS DP and PA	- Ethernet / Internet - Permanent installation - Web server - Multi network monitor - Multi access - Email and Log

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1.5.5 Offshore applications

With satellite internet offshore PROFIBUS networks can be remotely monitored. Emails can inform the mainland about the status of the installation.

These applications simplify maintenance and eliminate the hassle to fly an expert over to fix a possible problem.

On the LAN local technicians can also monitor the networks.

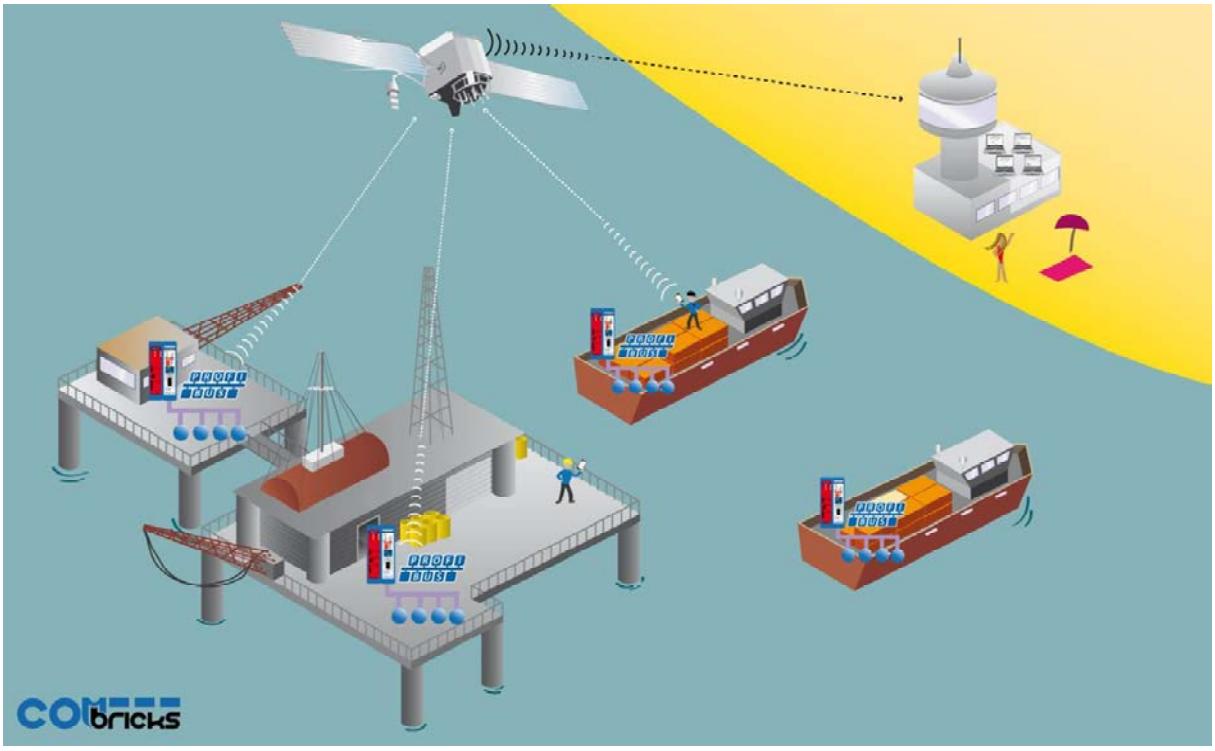

Fig. 4 - Offshore applications

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1.5.6 Mining applications

Because of the depth, gasses and inaccessible areas, COMbricks is required to keep the control room and the experts on a distance to monitor the PROFIBUS installations.

Multiple WLAN routers can bring Ethernet up to the surface.

With DTM technology the devices can also be diagnosed and parameterized.

Fig. 5 - Mining applications

1.5.7 Other applications

- Cross border installations
- Traffic control installations
- Water treatment
- Long commissioning and test cycles
- High availability networks
- 24-7 service contracts
- Robot cells

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1.6 Output control

Relay- and digital output modules can be configured to respond directly to bus problems like; bus voltage too low, retries, syncs, master lost, diagnostics, etc.

This offers a multitude of applications to directly and independently act on the machinery when the bus communication becomes unreliable. Especially when safety, human lives or the environment are at stake.

Power switches, hold switches, indicators, backup systems and LED towers are a few examples of machine parts that can be hooked up to the relays. COMbricks is the only monitoring product that has the capability to respond directly on the hardware with multiple relays.

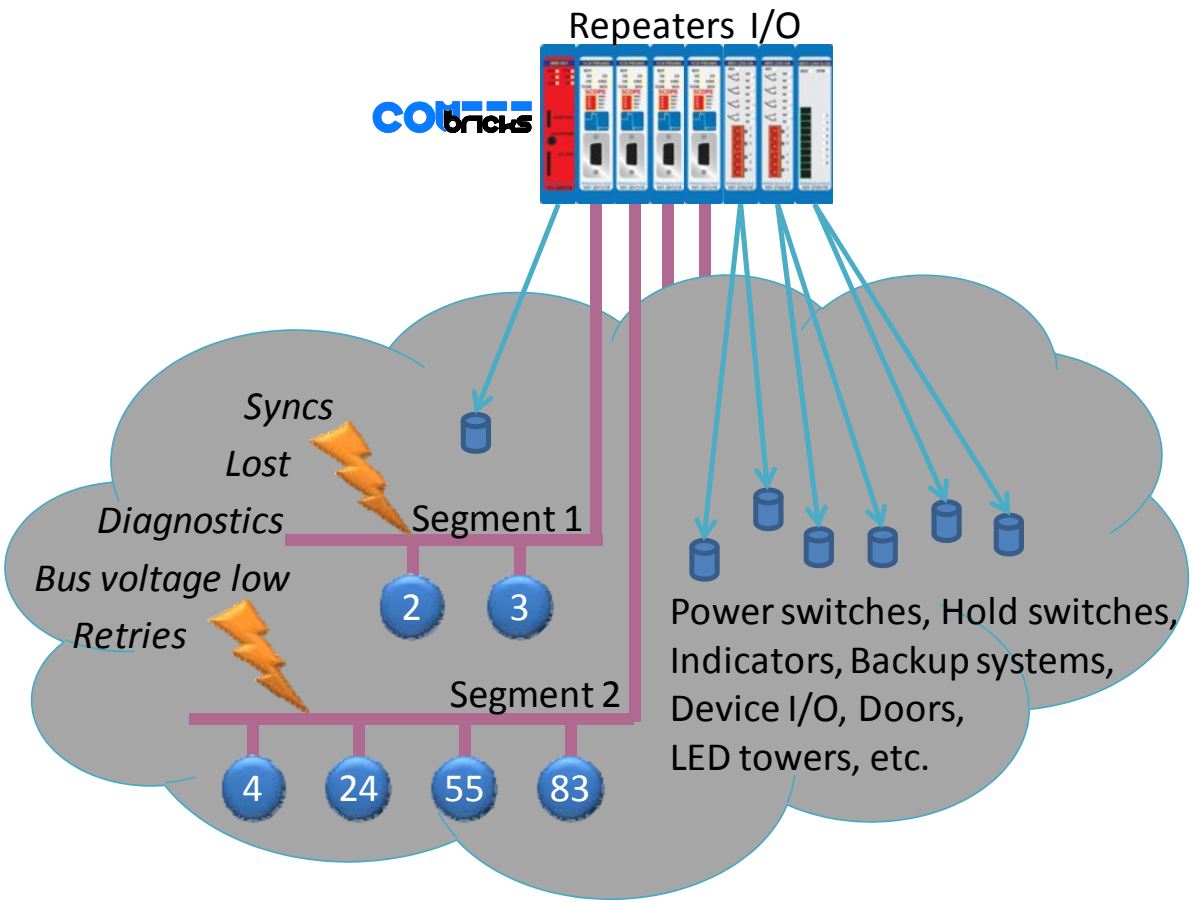

Fig. 6 - Output control

- The Head Station already contains 1 relay.
- The relays can also be configured to be switched manually or on time.

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1.7 CommDTM

The FREE COMbricks CommDTM offers FDT 1.2 based asset management tools a powerful Ethernet pass through to access PROFIBUS devices which are connected behind COMbricks repeater modules.

The internal DP-V1 class 2 masters are able to drive 2 out of 4 networks divided over the repeater modules. When a network connection is closed, the user can enter another network. The 2 active networks are managed by 1 or 2 PC Ethernet connections.

The CommDTM provides the same auto baudrate detection facilities as the famous ProfiCaptain. It detects all busparameters before it goes online. A free master address is also advised.

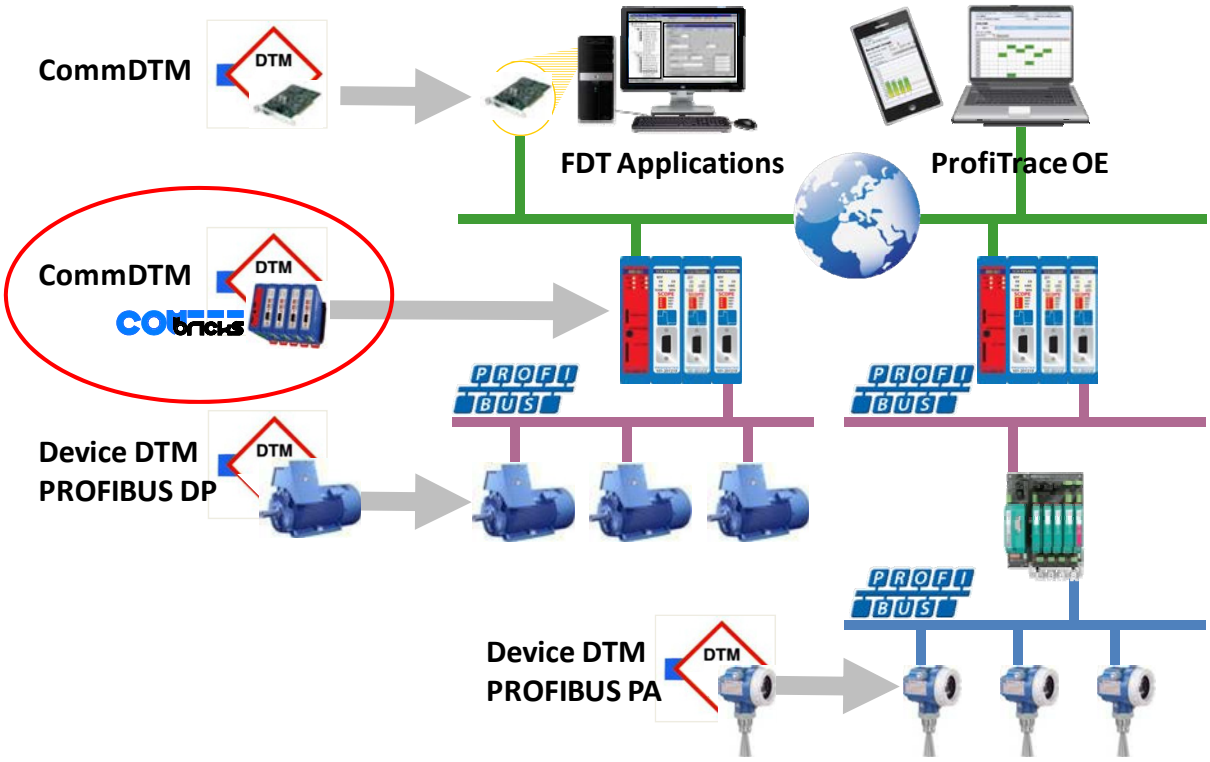

Fig. 7 - CommDTM structure

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2 Quick start

2.1 Quick start checklist

This checklist lists all the steps to a quick usage of COMbricks.

STEP 1:	Provide the Head Station with the latest firmware. .	(**7**)
STEP 2:	Prepare the backplane with the amount of required backplane units.	(**2.2**)
STEP 3:	Click the assembled backplane on the DIN-rail.	(**2.2**)
STEP 4:	Insert the Head Station in the most left slot.	(**2.3**)
STEP 5:	Insert the other modules in the remaining slots.	(**2.3**)
STEP 6:	Configure the repeater modules to their appropriate networks.	(**2.4**)
STEP 7:	Wire the repeater modules with PROFIBUS cables.	(**2.5**)
STEP 8:	Power the Head Station.	(**2.6**)

COMbricks units with Head Stations type 1A are now operational and no further steps have to be taken. For type 1B and 1C Head Stations proceed with the next steps.

STEP 9:	Insert an Ethernet cable in the Head Station.	
STEP 10:	Set the IP address to the required value.	(**2.7** + **2.8**)

COMbricks units with Head Stations type 1B and 1C are now operational, ProfiTrace OE is autonomously logging PROFIBUS events. After these basic steps COMbricks can be further configured through the web server.

STEP 11:	Checking the modules and administrative info in the web server.	(**2.9**)
STEP 12:	Testing ProfiTrace OE on the PROFIBUS installation.	(**2.10**)

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2.2 Prepare the backplane

Click the fixed backplane on the DIN-rail and add additional backplane units to the right side if required (see **Paragraph 3.3** and **3.4**).

2.3 Insert modules

Insert the required modules in the slots of the fixed backplane (see **Paragraph 3.6**). The Head Station with the red front plate should be placed in the most left slot (with the large connector). The other modules in the remaining slots. The slots have a polarity and can only be inserted one way.

2.4 Configure the repeater modules

Configure the repeater modules to their appropriate networks. This can be done with the dipswitches located at the front of the module (see **Paragraph 3.10.1**).

2.5 Wire the repeater modules

Connect the PROFIBUS cables to the repeater modules (see **Paragraph 3.11**).

2.6 Power the Head Station

Provide a 24 VDC power supply to the Head Station through one of its 2 power connectors (see **Paragraph 3.8**).

2.7 Customizing the IP number through the web server

The default IP address of the Head Station is **192.168.1.254**. Follow the steps below to customize the IP address of the Head Station:

STEP 1:	Insert an Ethernet cable in the Head Station which is connected to the enterprise LAN or directly to the PC.
STEP 2:	Make sure the IP address of your PC is on the same subnet as the switch (192.168.1.xxx).
STEP 3:	Open your web browser and enter 192.168.1.254 in the address field. This is the default IP address of the COMbricks.
STEP 4:	The web server of the COMbricks will appear.
STEP 5:	Click in the menu on the left on "IP config".
STEP 6:	Update the IP settings and confirm it by clicking on "Save" (see **Fig. 8**).
STEP 7:	The web page will now reload with the new IP address.

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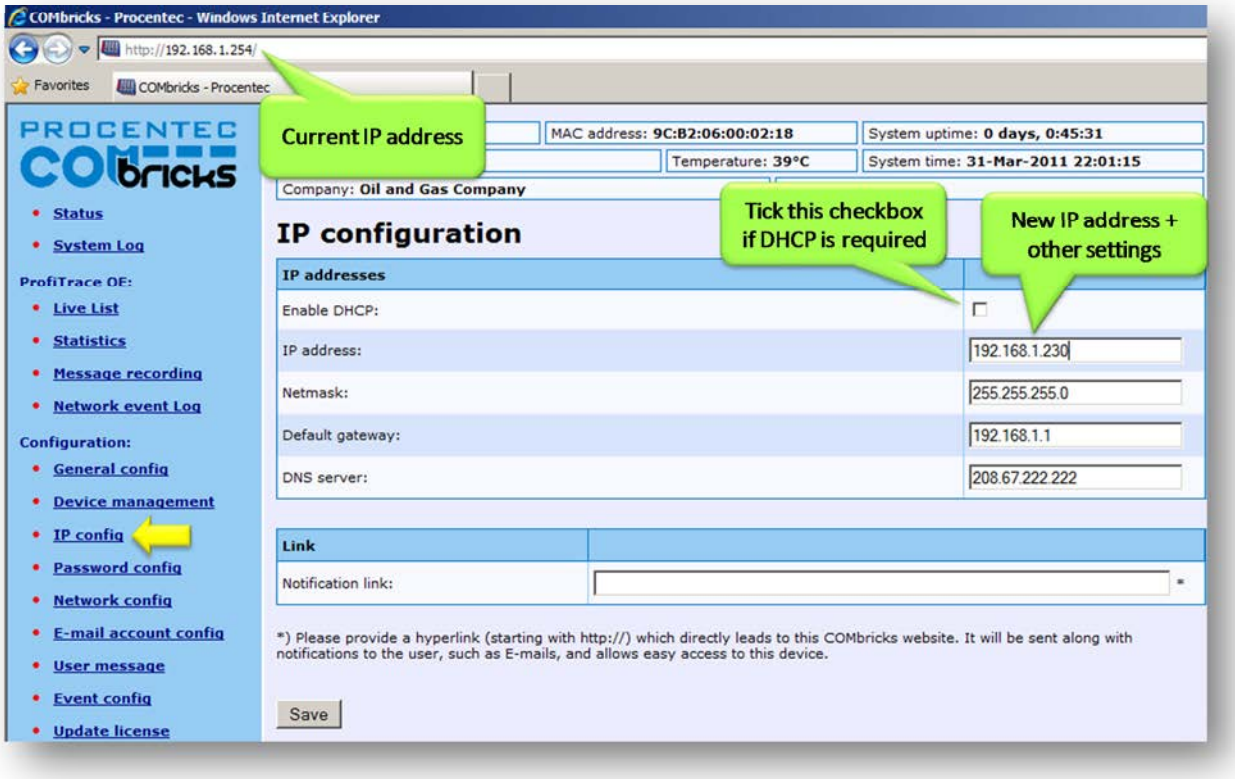

Fig. 8 - Customizing the IP address in the web server

The Notification link name is included in the event emails so that the user can directly jump to the specific COMbricks unit without knowing its local IP number. An example is: www.boiler5.oag.com. The router of the network or the internet server has to reroute this name to an IP number.

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2.8 Customizing the IP number through the Discovery Tool

The COMbricks Discovery Tool can be downloaded from **www.combricks.com**.

After start-up all the available COMbricks units can be discovered and directly customized with the required IP address (see **Fig. 9**).

The Discovery Tool works on an enterprise LAN, WLAN and with a direct cable between COMbricks and PC.

If you are not sure which COMbricks you are customizing, the LEDs can be flashed with a button in the Discovery tool (flashing). A couple of seconds the LEDs will blink to give the user a visual confirmation.

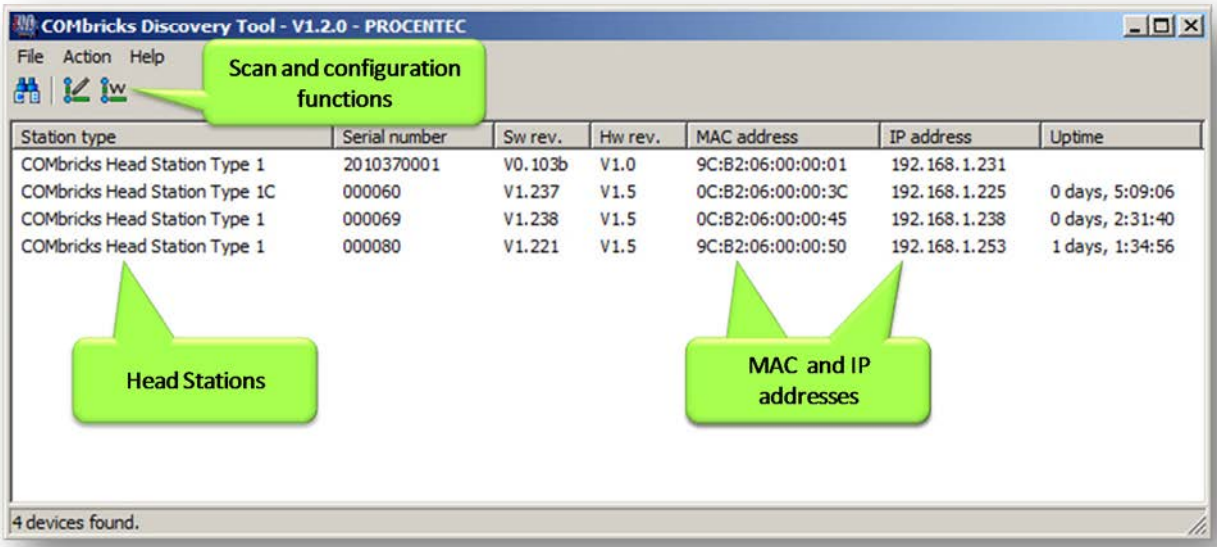
COMbricks Discovery Tool - V1.2.0 - PROCENTEC
File Action Help
Scan and configuration functions
Station type | Serial number | Sw rev. | Hw rev. | MAC address | IP address | Uptime
COMbricks Head Station Type 1 | 2010370001 | V0.103b | V1.0 | 9C:B2:06:00:00:01 | 192.168.1.231 |
COMbricks Head Station Type 1C | 000060 | V1.237 | V1.5 | 0C:B2:06:00:00:3C | 192.168.1.225 | 0 days, 5:09:06
COMbricks Head Station Type 1 | 000069 | V1.238 | V1.5 | 0C:B2:06:00:00:45 | 192.168.1.238 | 0 days, 2:31:40
COMbricks Head Station Type 1 | 000080 | V1.221 | V1.5 | 9C:B2:06:00:00:50 | 192.168.1.253 | 1 days, 1:34:56
Head Stations
MAC and IP addresses
4 devices found.

Fig. 9 - COMbricks Discovery tool

It is recommended to have only one Ethernet connection active (only wireless or only wired). In some cases the Discovery tool does not list all the COMbricks units when multiple Ethernet connections are active.

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2.9 Checking the modules and the administrative info in the web server

After customizing the IP address, the modules can be checked in the web server. Click on "Status" to see an overview of the available modules and their respective description + version numbers (see **Fig. 10**).

Modules can be inserted and removed during operation. A change in hardware should be directly visible in the Status screen.

On the top of the screen the administrative info is also visible (see **Fig. 10**). If the administrative information has to be altered, it can be done by clicking on "General config".

On the bottom of the screen the connected clients with this COMbricks are visible.

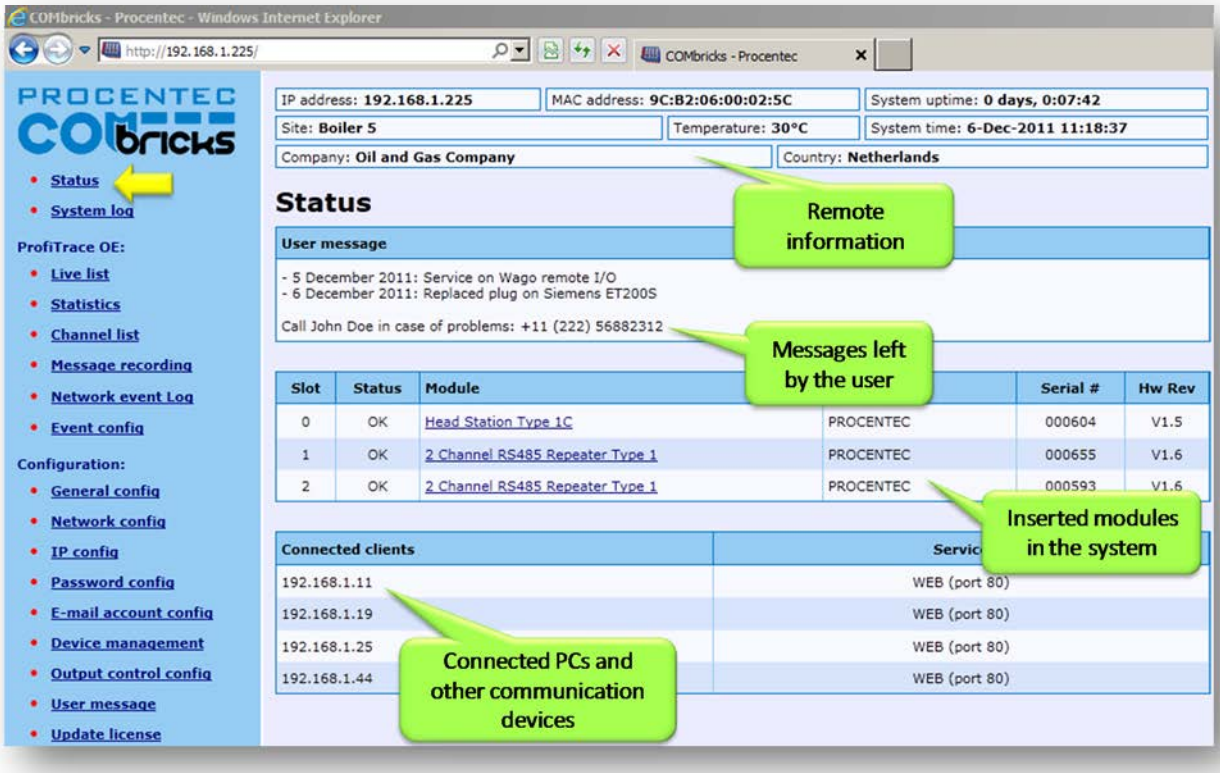

Fig. 10 - Overview of the available modules

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2.10 Testing ProfiTrace OE on the PROFIBUS installation

When the repeaters are wired to the PROFIBUS installation, ProfiTrace OE can be tested in the web server.

Click on "Live List" and the respective networks. A Live List with devices should appear (see **Fig. 11**).

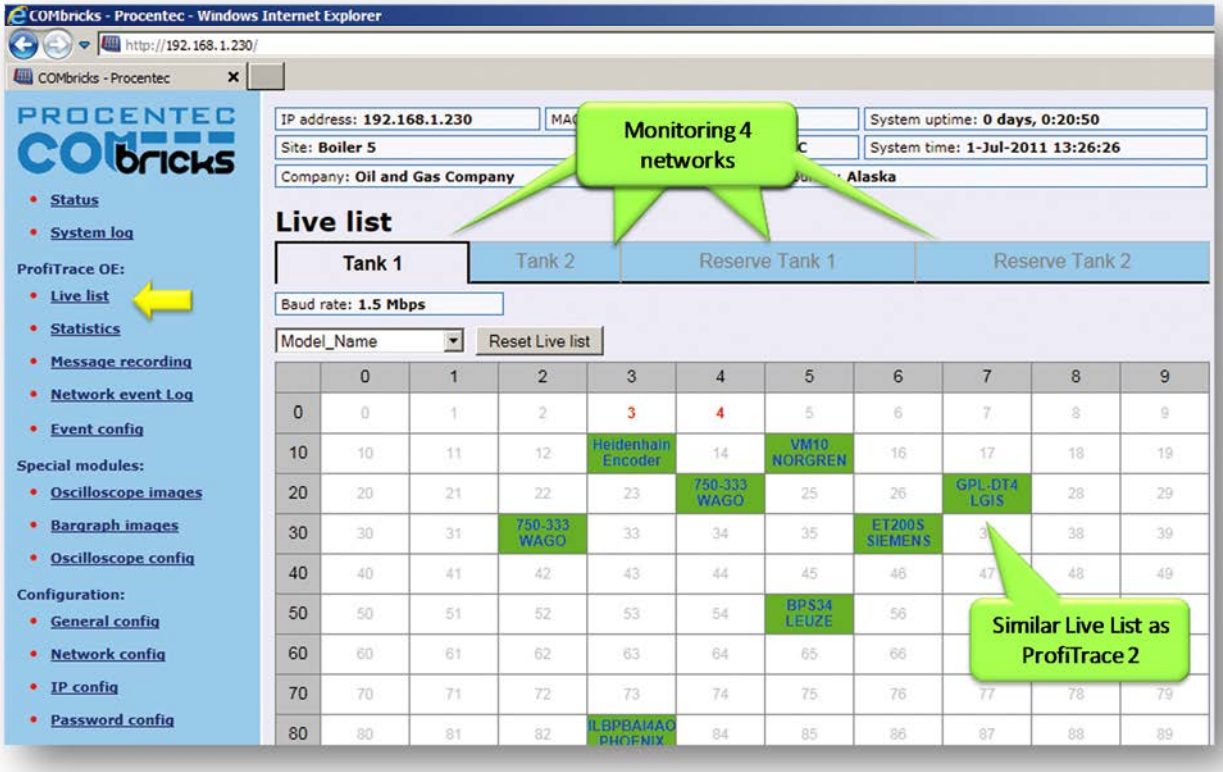

Fig. 11 - ProfiTrace OE Live List

See **Chapter 5** for more information how to use ProfiTrace OE.

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2.11 Resetting the Head Station

By means of the "Menu Nav" switch on the front of the Head Station (see **Fig. 12**), COMbricks can be reset, warm started or loaded with configuration data. Please follow the procedure described in **Paragraph 6.5**.

The following selections are possible:

- Read settings from SD card
- Save settings on SD card
- Clear password
- **Reset to factory defaults**
- Warm start

Fig. 12 - Menu switch

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3 Installation instructions

3.1 Location

COMbricks can be installed everywhere in a non-hazardous area that complies with IP 20 (DIN 40 050) and the specified temperature range of 0..60 ^{o} Celsius.

3.2 Position

COMbricks can be installed in every position, but it is recommended to install it with the cables pointing down. In this position it is also easier to read the status LEDs.

3.3 Mounting and un-mounting backplane units

The backplane of the COMbricks has to be mounted on 35 mm DIN-rail with a minimum width of 50 mm to fit a fixed backplane for 2 Modules.

Fig. 13 illustrates how to mount and dismount the backplane on and from the DIN-rail. For the un-mounting an appropriate screwdriver is required.

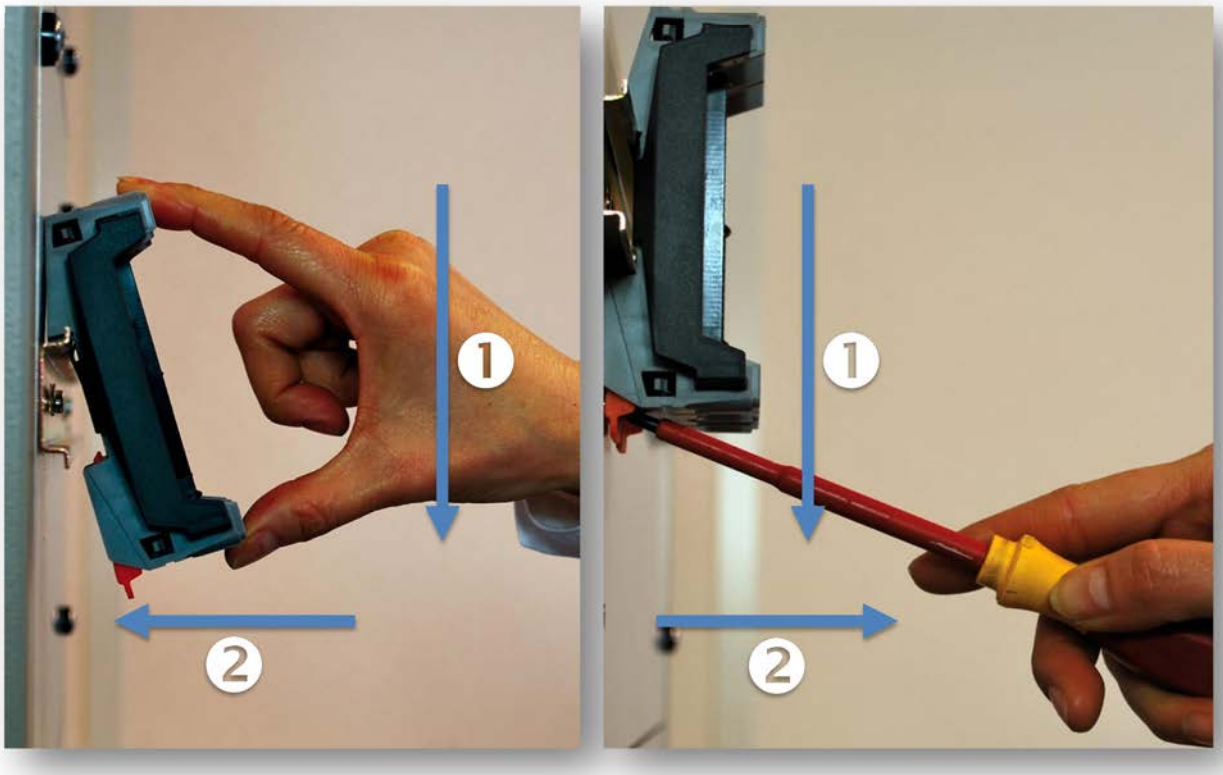

Fig. 13 - Mounting (pull-down + push) Un-mounting (click tap + pull)

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3.4 Adding backplane units

The additional backplane units as described in **Paragraph 3.3**. To merge them remove the plastic covers on the side of the backplane units that have to be merged. Push both backplane units together until no more movement is possible (see **Fig. 14**).

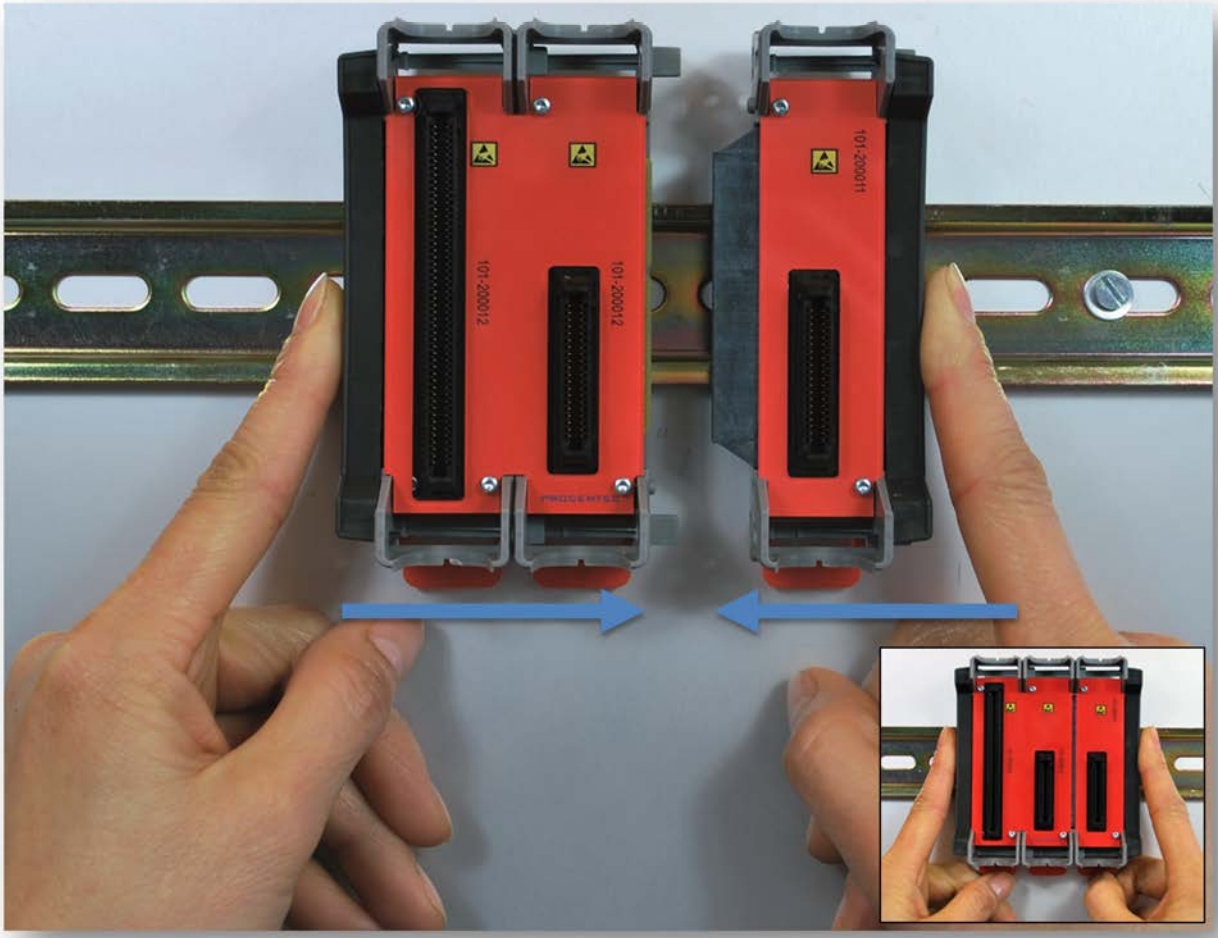

Fig. 14 - Adding backplane units

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3.5 Detaching backplane units

Detaching backplane units is a delicate procedure that should be done according the description below and **Fig. 15** in order to prevent damages.

STEP 1:	Push with a screwdriver the top arm down and pull delicately the top of the backplane unit that has to be removed. The arm should now be "free".
STEP 2:	Push with a screwdriver the bottom arm down and pull delicately the bottom of the backplane that has to be removed. The arm should now be "free".
STEP 3:	Pull the backplane unit from the section that remains.

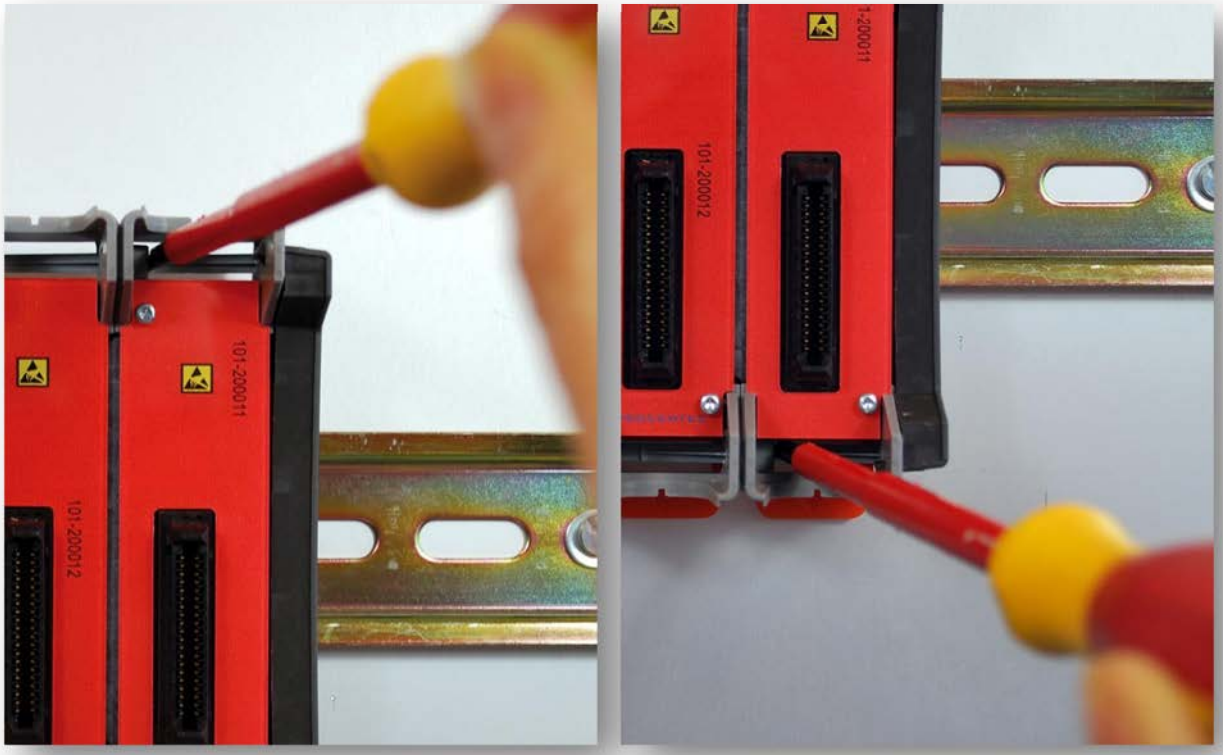

Fig. 15 - Detaching backplane units

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3.6 Inserting modules

Push the modules in the slots of the backplane (see **Fig. 16**).

The Head Station (with the red front plate) should be placed in the most left slot (with the largest connector) and the other modules in the remaining slots.

When the modules are inserted the correct way, a sharp clicking sound should be heard during the push.

Modules can be inserted during operation.

The slots have a polarity and fit only one way.

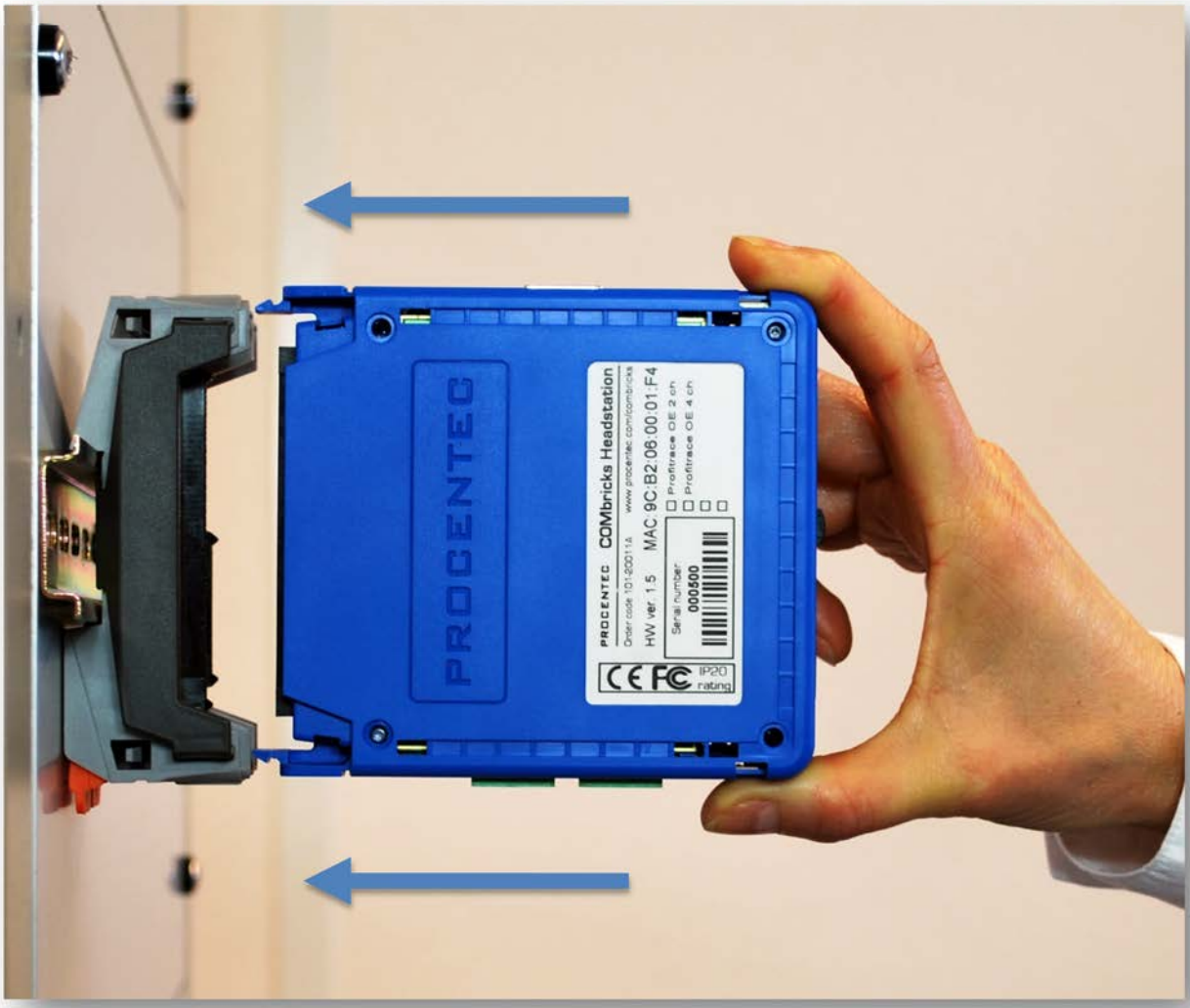

Fig. 16 - Inserting modules

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3.7 Removing modules

To remove a module press the keys on both sides of the module (this has to be done with 2 hands). When both keys are pressed, pull the module out of the slot (see **Fig. 17**).

Modules can be removed during operation.

1 Slot between 2 modules can remain empty when modules are removed during operation. Modules at the end of the backplane can always be removed (1-by-1).

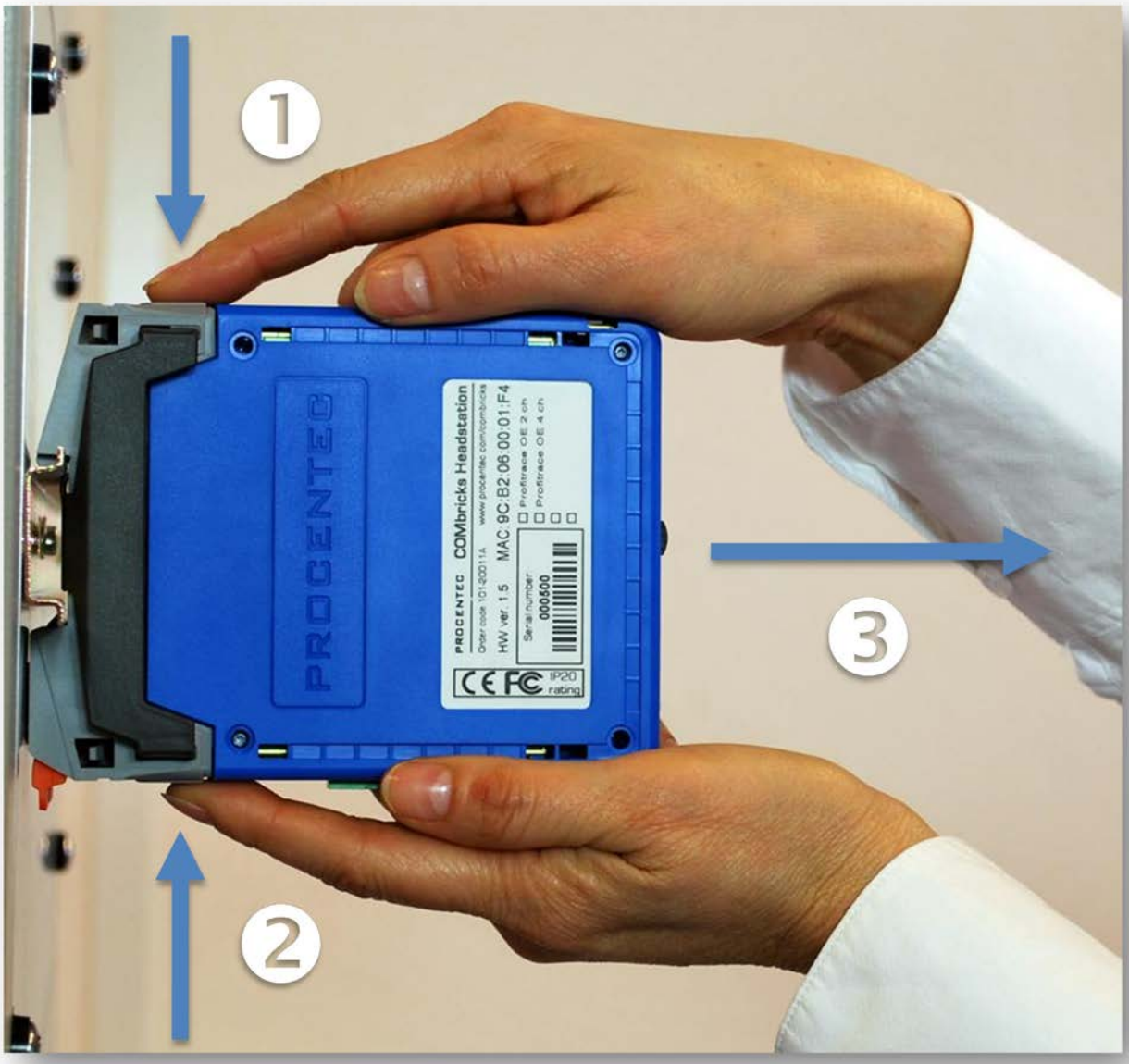

Fig. 17 - Removing modules

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3.8 Wiring Ethernet

The Ethernet connector is located on the top-side of the Head Station. The connector contains LEDs that indicate linkup and reception of data.

It's recommended to use a cable/RJ45 plug with grounding/foil due to the nature of the industrial applications.

The Ethernet interface complies with the standard Ethernet guidelines. The maximum cable length from COMbricks to switch/device is maximum 100 m.

The MAC address is printed on the side of the Head Station.

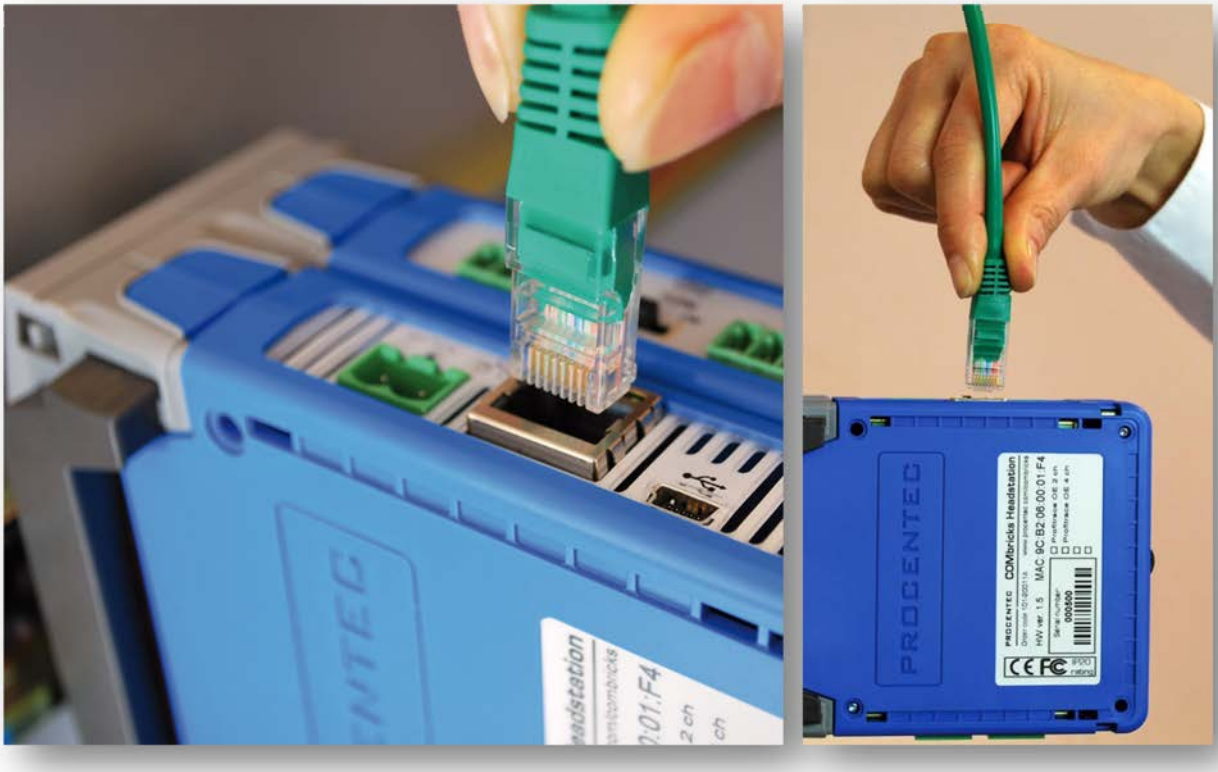

Fig. 18 - Wiring Ethernet

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3.9 Power Supply

The Head Station contains two 3-pin screw type power connectors on the side. If power redundancy is NOT required, either one can be used.

The layout is as follows (when the wires are pointing down):

1 = **-** (left)

2 = **+** (middle)

3 = **SH** (right)

The power supply has to comply with the following specifications:

- Voltage: **10.8 .. 26.4 VDC**
- Current: **Min. 800 mA**
- Wire diameter: **< 2.5 mm^2**

3.9.1 Procedure

To connect the 24 VDC supply to the 3-pin screw-type terminal, proceed as follows:

STEP 1:	Strip the insulation of the conductors of the 24 VDC power supply.
STEP 2:	Secure the conductors in the screw-type terminal.
STEP 3:	Insert the entire connector block in the power socket (see **Fig. 19**).

To connect the power supply a 3 mm screwdriver is required.

3.9.2 Testing and commissioning

If the power is switched ON it can be diagnosed by the following indicator procedure:

- ❑ All LEDs on the Head Station should be shortly ON.
- ❑ The RDY LED should be shortly Blinking.
- ❑ The SD LED should be ON (if an SD card is inserted).
- ❑ The RDY LED should be ON (also on other inserted Modules).

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Fig. 19 - Head Station power supply

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3.10 Configuring repeaters modules

The repeaters can be configured by the dipswitches located at the front of the module or the web server.

3.10.1 Customizing the PROFIBUS network (NW0/NW1)

Set these dipswitches to following positions to customize a channel for a specific PROFIBUS network.

NW0	NW1	Network
LEFT	LEFT	1
RIGHT	LEFT	2
LEFT	RIGHT	3
RIGHT	RIGHT	4

When software settings are preferred these dipswitches do not have to be set.

3.10.2 Redundancy (RED)

Set this dipswitch to enable the redundancy group for the channel.

RED	Redundancy
LEFT	OFF
RIGHT	ON

When software settings are preferred this dipswitch does not have to be set.

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3.10.3 Hardware or software settings (H/S)

Set this switch to enable hardware (dipswitches) or software settings.

H/S	Settings
LEFT	Hardware
RIGHT	Software

When software is enabled, all switch settings are overruled. The settings are saved in the internal memory of the Head Station.

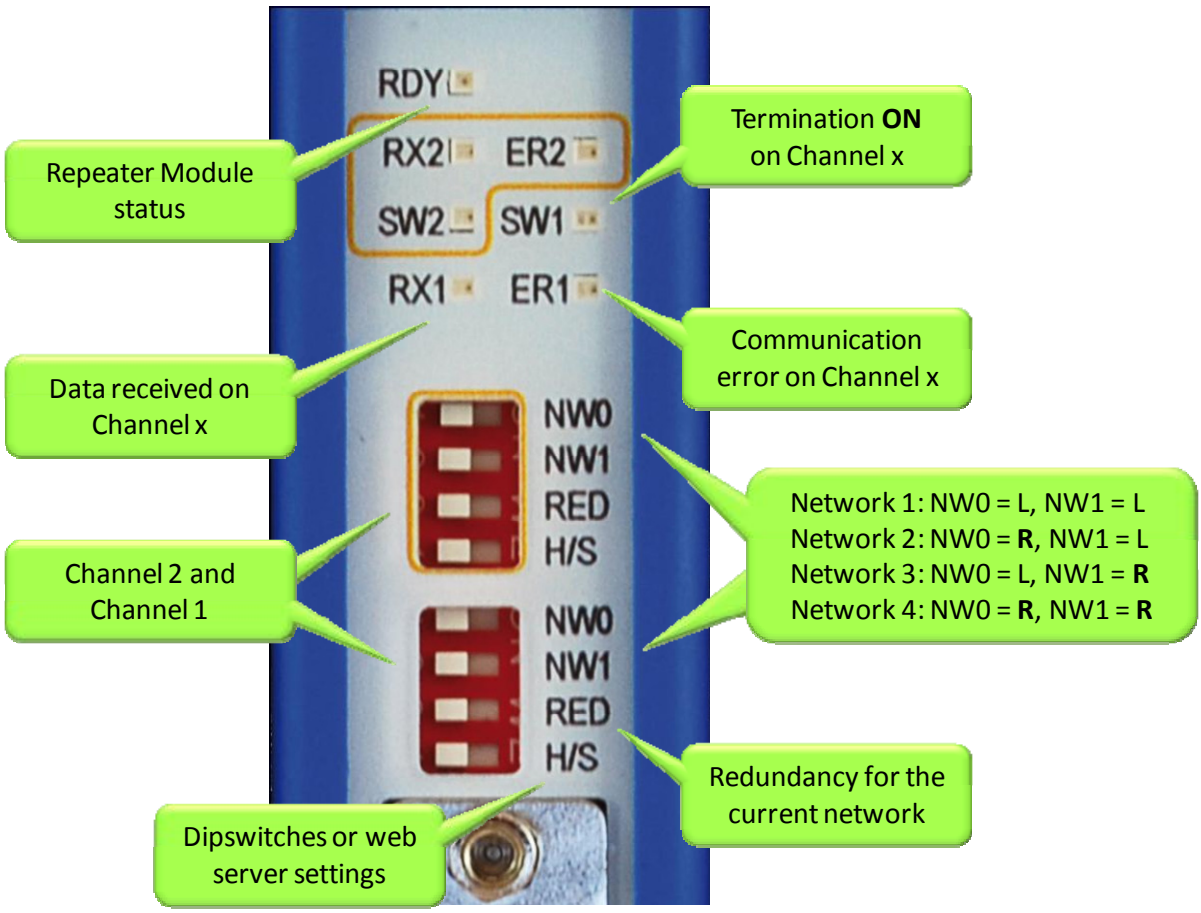

Fig. 20 - Dipswitches and LEDs of the repeaters

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3.11 Wiring repeater modules

The PROFIBUS cable should be wired to the repeaters according the PROFIBUS guidelines with suitable cable for the application you are using.

Regular and SCOPE repeater modules are equipped with screw terminals and a DB9 connector for the bus connection. Both are linked with each other, but it is not recommended to use them both[1].

Fig. 21 illustrates 4 recommended connection topologies for the repeater modules.

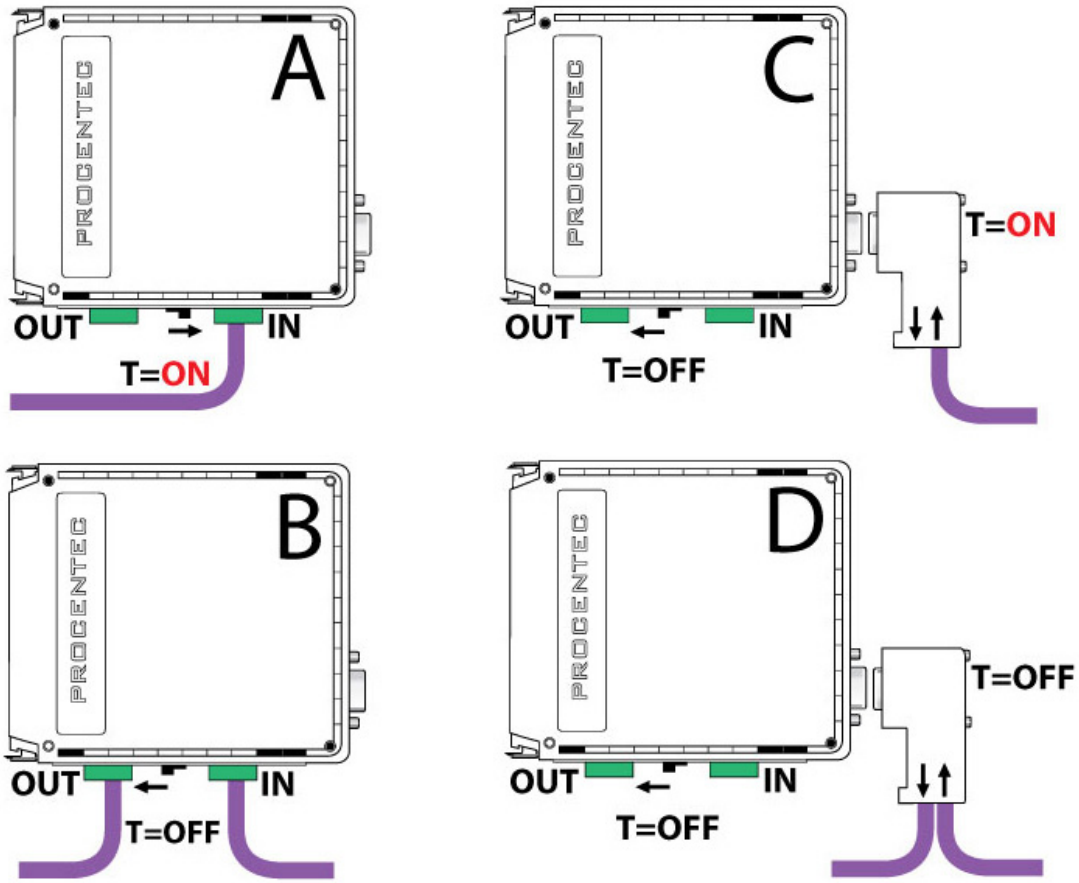

Fig. 21 - Repeater connection topologies

3.11.1 Screw terminals

- With a 1 channel repeater module, the channel is marked CH1.
- With a 2 channel repeater module, the channels are marked CH1 and CH2.

The channels (CHx) have 2 screw terminals (IN and OUT) for the bus connection and a termination switch.

[1] Because of the PROFIBUS spur lines limitations it is not recommended to use the screw terminal simultaneously with the DB9 connector.

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When the repeater module is the last on the segment, the cable should be wired to IN and the termination should be set to ON (see **Fig. 21 - configuration A**).
Only in configuration A the on-board termination should be set to ON. In configurations B the repeater module is in the middle of the segment (OFF).

Pin layout of the screw terminals
Pin “A”: Green wire
Pin “B”: Red wire
Pin “SH”: Cable shielding OR
Pin “I”: Cable shielding

3.11.2 DB9 connector

The bottom channel (CH1) is additionally equipped with a DB9 connector to offer an alternative connector for standard 9-pin PROFIBUS plugs (1-on-1 with the screw terminals).

When the DB9 connector is utilized and located at the end of the segment, it is recommended to use the termination on the DB9 connector and NOT on the repeater module (see **Fig. 21 - configuration C**)[2]

To connect the PROFIBUS cable to the repeater modules (screw terminals) a 2.5 mm screwdriver (max. 0.4 mm) is required.

3.11.3 Testing and commissioning

If the channel recognizes valid PROFIBUS messages from 1 or more connected devices, the RX LED of this channel should be blinking and ER should be OFF.

When the termination of a specific channels is set to ON, the SWx LED should be ON.

[2] The plug is the best place to activate the termination! When you remove the device from the bus you still have the termination in the plug which is attached to the bus cable. Maybe the 5V power is gone (which is always required), but better this than nothing at all.

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4 Web server

To access the web server of COMbricks, open your web browser and enter the IP address that has been setup (after purchase or reset the default IP address is 192.168.1.254**). In the Discovery Tool there is also a direct link to the web server with the default Windows browser.**

If the User password has been setup a screen will appear to login first in order to access the web server. If only the Administrator password has been setup it is not necessary to login to directly, but when settings are altered you must be logged in (See **Paragraph 4.7**).

Some web pages described in this manual are only accessible with certain Head Station types, licenses or firmware versions.

After the web page has been loaded, the pages of the web server can be visited by clicking on the items in the menu on the left side of the screen. The next paragraphs will explain the primary web server pages.

The web server can handle 20 simultaneous client connections. When all 20 are utilized, the connection with the COMbricks could become relatively slow.

Web browsers have to comply with at least the following versions:

- Firefox	2.0 (24 October 2006)
- Internet Explorer	6.0 (27 Augustus 2001)
- Google Chrome	1.0 (24 April 2009)

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4.1 Status

Head Stations: **1A, 1B, 1C**
Firmware: **V1.140 and higher**
Login: **User or Administrator**

The 'Status' screen is the first web page that appears when the web server is accessed . This page gives an overview of the available modules and their respective description + version numbers (see **Fig. 22**).

Modules can be inserted and removed during operation. Changes in hardware should be directly visible in the Status screen.

The 'User message' with custom messages/info is also displayed here (see **Fig. 22**).

On the top of the screen the network and site info can be inspected (see **Fig. 22**).

On the bottom of the screen the connected clients with this COMbricks are visible (see **Fig. 22**).

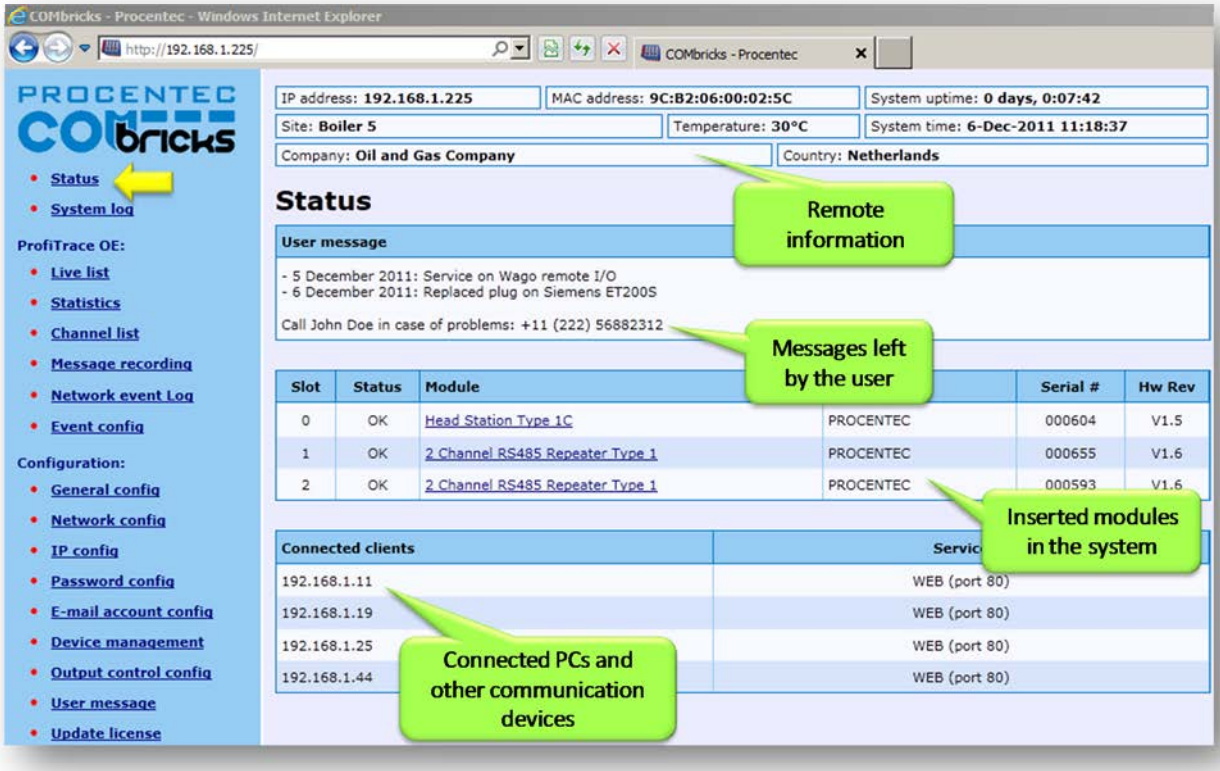

Fig. 22 - Status screen

Some advanced modules offer their specific status screen. Click on the link (name in the module column) and the respective web page will be displayed (see **Fig. 23**).

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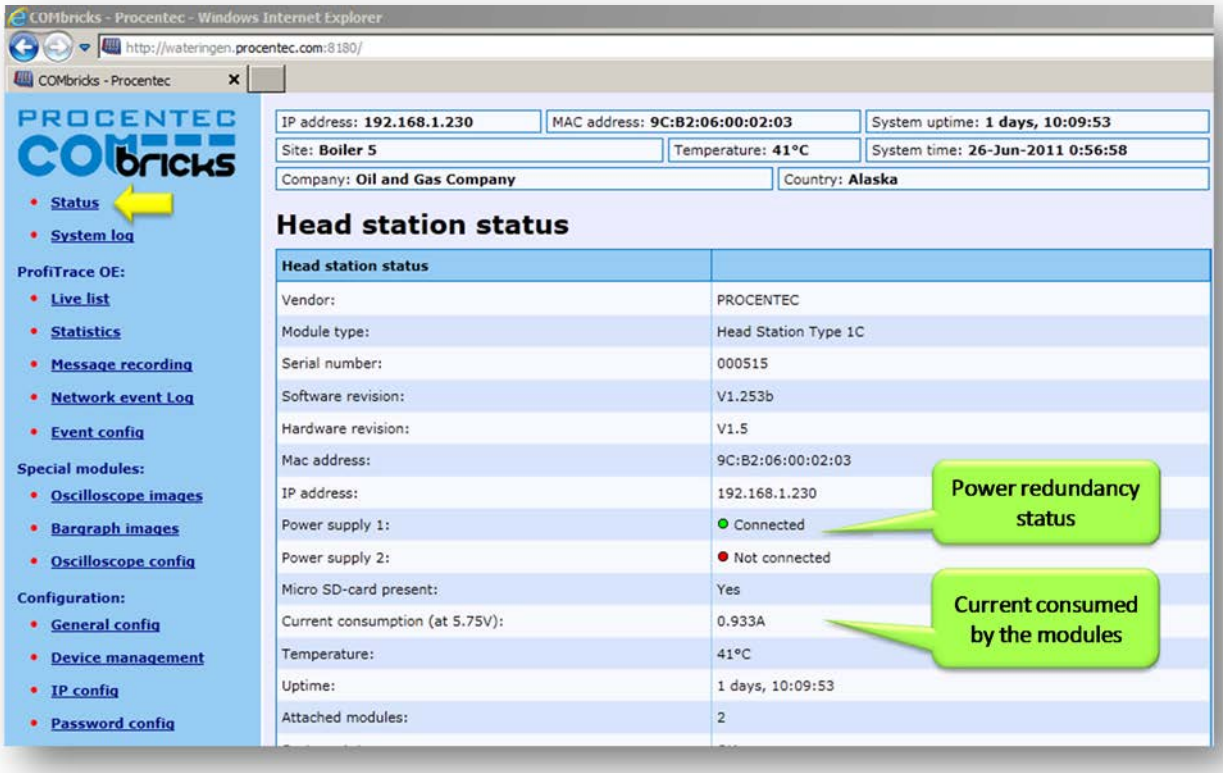

Fig. 23 - Example of a module status

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4.2 Channel list

Head Stations: **1A, 1B, 1C**
Firmware: **V1.152 and higher**
Login: **User or Administrator**

A helpful utility is the Channel list. This page visualizes a graphical overview of all devices in the network and behind which network module they are connected. It is almost comparable with a logical topology scan (see **Fig. 24**).

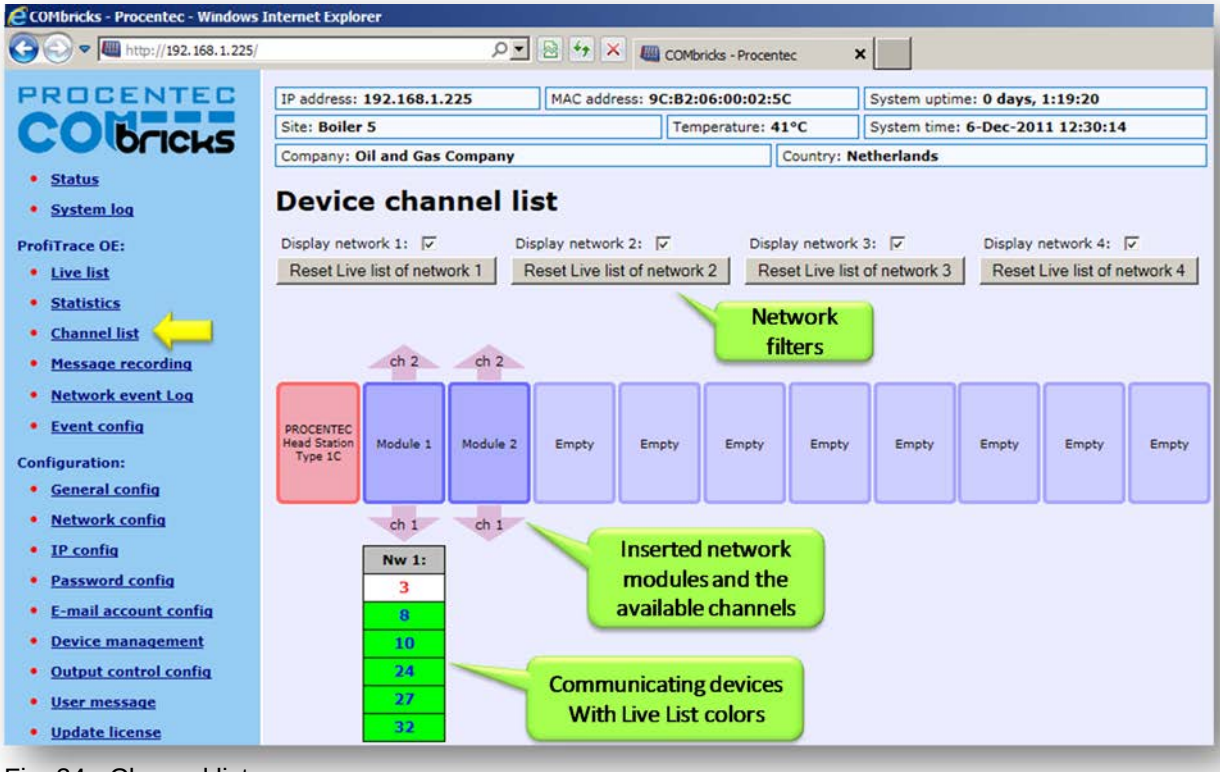

Fig. 24 - Channel list

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4.3 System log

Head Stations: **1A, 1B, 1C**
Firmware: **V1.140 and higher**
Login: **User or Administrator**

The 'System log' saves COMbricks events. When this page is accessed all the COMbricks events are displayed. It can be downloaded as text file and cleared (see **Fig. 25**).

The 'System log' is;

- **kept intact** after a power down and continues its logs after a power-up.
- **auto/live updating** when this screen is accessed.
- **saved** on the SD card.

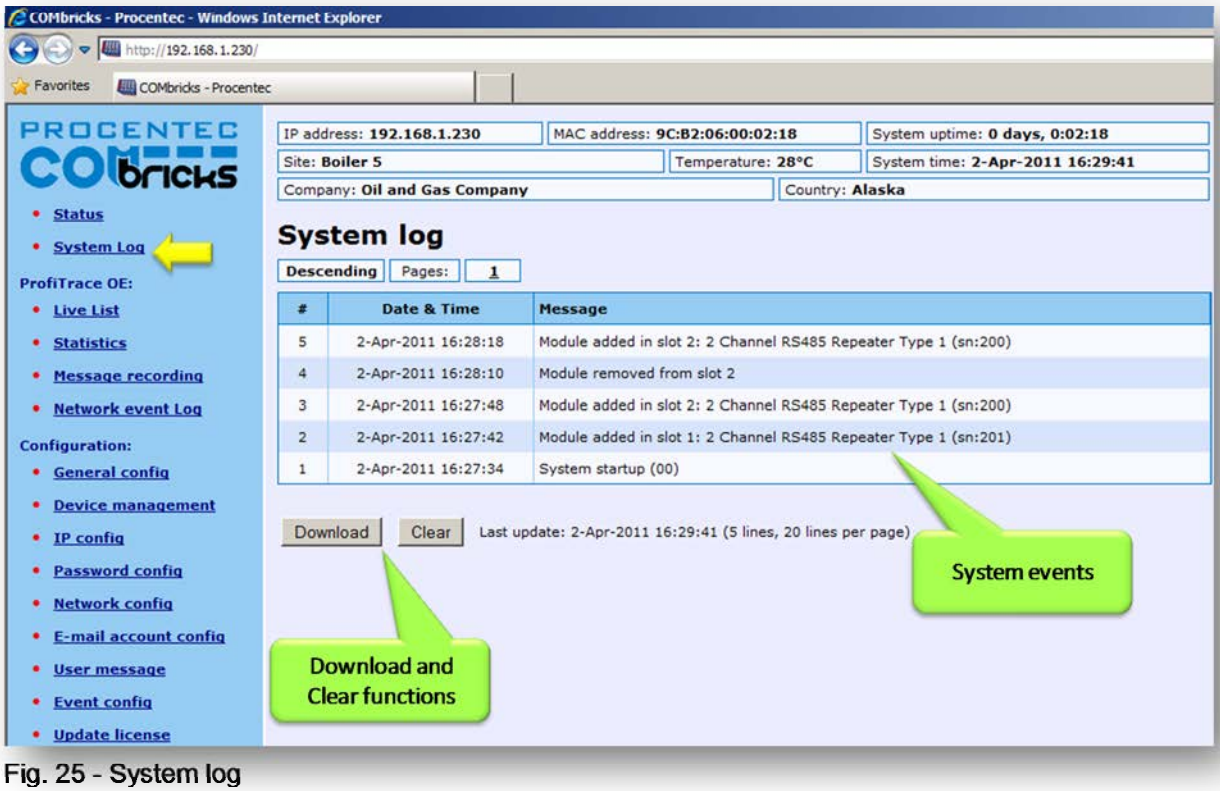

Fig. 25 - System log

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4.4 General configuration

Head Stations: **1A, 1B, 1C**
Firmware: **V1.140 and higher**
Login: **Administrator**

The basic settings of the COMbricks are customized on the 'General configuration' page. For the optimal use of ProfiTrace OE, it is important that the time is synchronized and the site info is sufficiently filled in (see **Fig. 26**).

The display refresh rate has to be tuned to the bandwidth of the Ethernet connection. By default it is set to a 1 second automatic refresh. If the bandwidth is limited, it is recommended to increase this time or to switch the automatic refresh OFF (see **Fig. 26**).

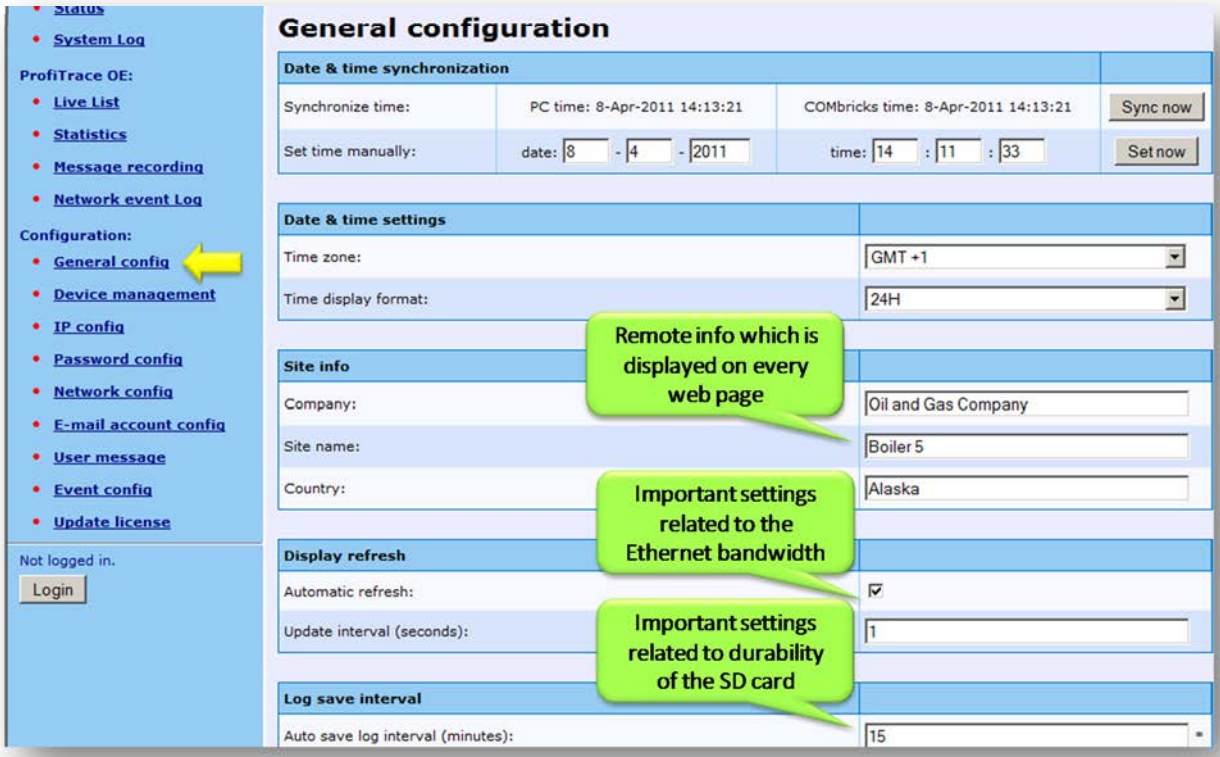

Fig. 26 - General configuration

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4.5 Network configuration

Head Stations: **1A, 1B, 1C**
Firmware: **V1.252 and higher**
Login: **Administrator**

The network names and the assignment of the repeater modules are customized here. For the optimal use of ProfiTrace OE, it is important that correct and understandable network names are defined (see **Fig. 27**). The network names are used in multiple components: ProfiTrace Live List, event emails, message recording, etc.

The network assignment of the repeater modules is also displayed and can be adjusted if software settings are enabled (see **Fig. 27**).

Dipswitch settings are always primary to software settings.

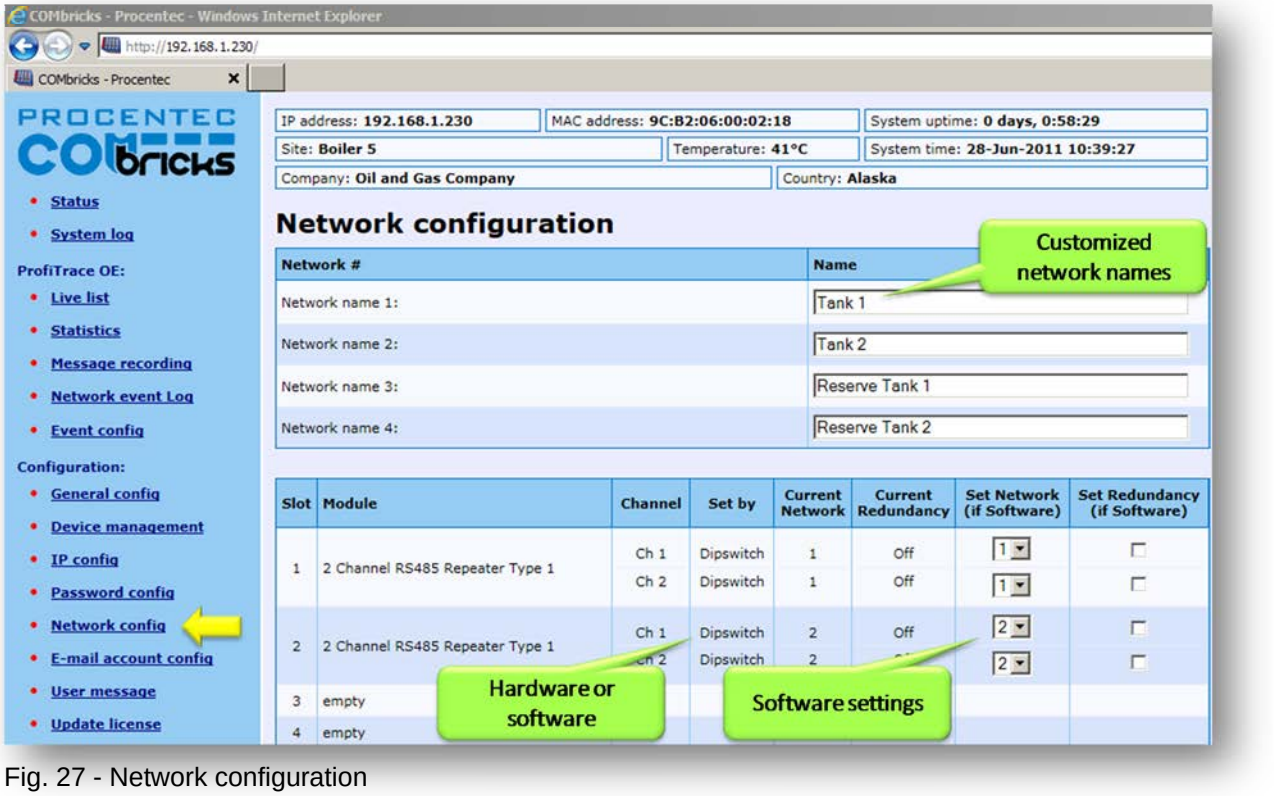

Fig. 27 - Network configuration

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4.6 Output Control

Head Stations: **1A, 1B, 1C**
Firmware: **V1.254 and higher**
Login: **User**

With the Output Control feature the user can directly respond to an event with the onboard relay in the Head Station or the channels from output modules in the backplane. The web server offers 10 customizable controls that can be set to the following behavior;

- No active
- Manual ON/OFF — Live toggle of the output channels
- Bus event — Syncs, retries, bus voltage too low, etc.
- Time — Time ON and Time OFF

Fig. 28 - Output Control

After power down/up, the COMbricks continues with these settings.

It is recommend that have a security policy concerning passwords with this feature, because the user is now able to control REAL output points.

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4.7 Password setup and login

Head Stations: **1A, 1B, 1C**
Firmware: **V1.100 and higher**
Login: **Administrator**

Passwords are NOT activated when the product is purchased or reset and all menu items are accessible and adjustable.

COMbricks supports 2 types of passwords;

User	Is limited to read information.
Administrator	Has access to the full web server and can adjust settings.

- The Administrator password has to be set first.
- The passwords are visible during the typing.
- The passwords can have a length between 1 and 16 characters.

Fig. 29 illustrates the password setup web page.

4.7.1 Access rights

After a password(s) has been setup, it complies with the access rights from the table below.

Table 1 - Access rights after password setup

	NO Passwords	Administrator	User (Admin. is set)
Login required at web server access	NO	NO[3]	YES
Visiting web pages	YES	YES	YES
Clear "System log"	YES	YES	YES
Restart the device in the "Device management"	YES	YES	YES
Output Control	YES	YES	YES

[3] When only the Administrator login has been activated, the user can always enter the web server without a valid login. When settings are about to be altered, the user is required to login.

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	NO Passwords	Administrator	User (Admin. is set)
Changing passwords	YES	YES	NO
Adjusting all other settings	YES	YES	NO

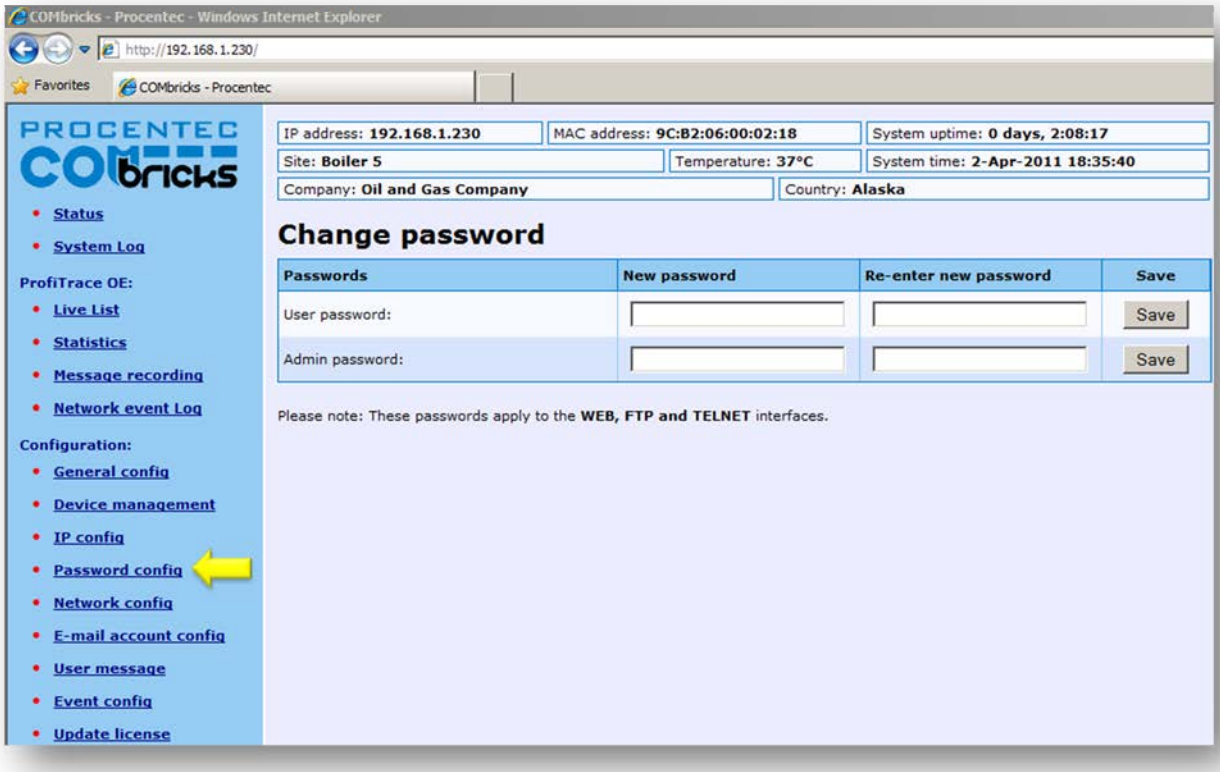

Fig. 29 - Password setup

4.7.2 Password best practice

We encourage you to at least setup the Administrator password if more than 1 person can have access to the network.

- Activate the password(s) immediately after installation or at the office before it is transported to the final destination.
- Use different passwords for the Administrator and User.
- Never share passwords with anyone.
- Always use strong passwords. Avoid: *test, 123456, <your company name>, <your first name>, combricks, procentec, etc.*
- Change passwords immediately if they may have been compromised.

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- If passwords must be written down, store it in a secure place and destroy it when it is no longer needed.
- Be careful about where passwords are saved on computers. Some dialog boxes, such as those for remote access, present an option to save or remember passwords. Selecting this option poses a potential security threat.

4.7.3 External protocols

The following login information is required for external protocols, like; FTP and TELNET.

Login name: **user** or **admin**
Password: <**your password>**

In case no password has been setup, COMbricks will accept any password during the connection phase.

4.7.4 Clearing password(s)

There are a couple of ways to restore the password(s) to their default setting:

- Change the passwords with no text written in the text field (*Administrator login required*).
- Restore to factory default settings in the "Device management" page (*Administrator login required*).
- Restore to factory default settings with the switch on the front of the Head Station (see **Paragraph 6.5**).

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4.8 License update

Head Stations: **1A, 1B, 1C**
Firmware: **V1.252 and higher**
Login: **Administrator**

In case the user wants to update the license of the Head Station, it can be done here via an internet connection or copy the content of a license file.

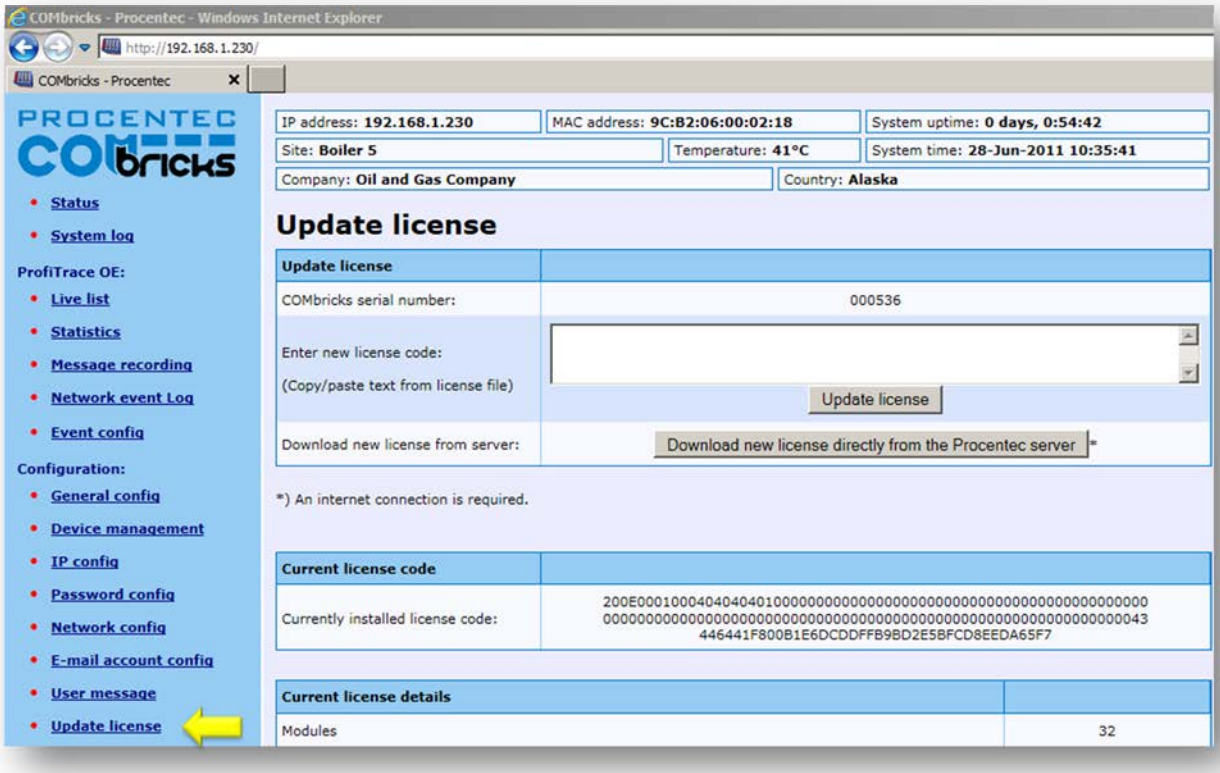

Fig. 30 - License update

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4.9 Document download page

Head Stations: **1A, 1B, 1C**
Firmware: **V1.253 and higher**
Login: **User or Administrator**

To provide the user with documentation, firmware and software, the SD card has been provided with a document download page (see **Fig. 31**).

- Download the latest version of the document download page from www.procentec.com
- The content of the *.ZIP* file has to be copied to a directory *\DOC* on the SD card.
- If the directory does NOT exist, create it and copy the content of the *.ZIP* file to it.
- Reload the web server to update the information.
- There should be an item called "Downloads" on the bottom of the left menu

It is possible to replace the PROCENTEC download page with a customized version. Replace *index.hml* with your own version and you can point to directories/files which are located on the SD card. If you are interested in such activities, we recommend you to inspect the structure of the PROCENTEC index.html first.

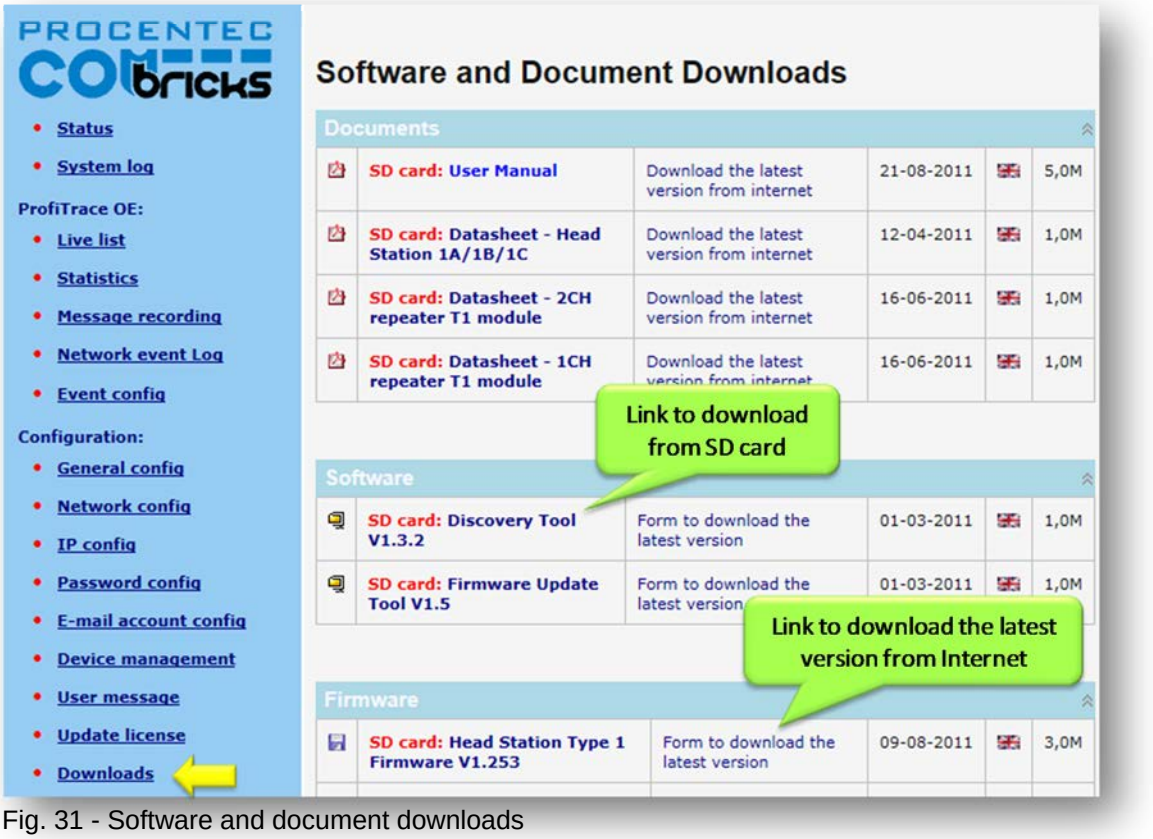

Fig. 31 - Software and document downloads

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4.10 Email account config

Head Stations: **1A, 1B, 1C**
Firmware: **V1.253 and higher**
Login: **Administrator**

The email account information has to be entered in case the user wants to have COMbricks signal events by email. The required information is generally the same like any other email related setup (see **Fig. 32**).

Setting up the email server parameters is not enough. The events that generate the emails have to be setup in the Event config menu (see **Paragraph 5.4**).

The SMTP server has to support **unencrypted** connections, because the current COMbricks firmware does NOT support encrypted connections such as SSL/TLS. The DNS address (IP config menu) has to be modified according to the DNS addresses of your internet provider.

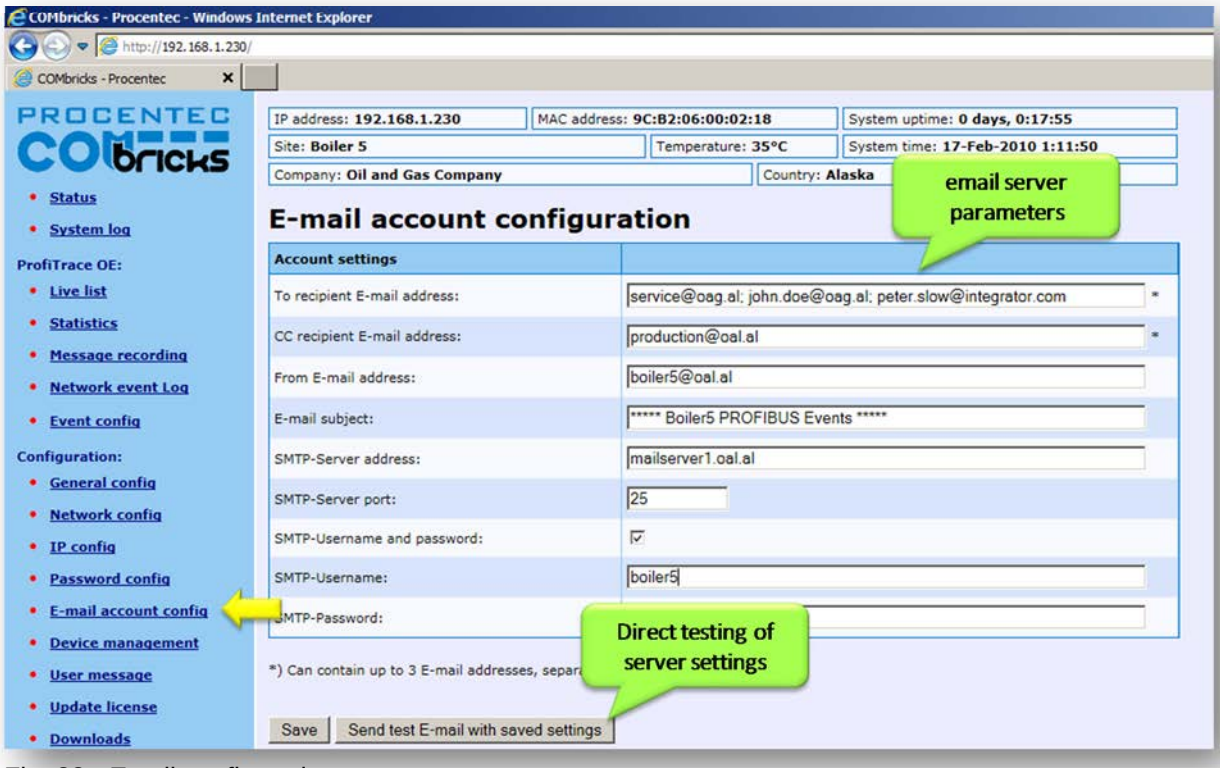

Fig. 32 - Email configuration

The server parameters have to comply with the email server parameters listed in **Table 2**.

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Table 2 - Email server parameters

Server parameters	Mandatory	Additional information	Size
To	YES	If you enter multiple addresses (max. 3) separate them with the ; character.	200
Cc	Optional	If you enter multiple addresses (max. 3) separate them with the ; character.	200
From	Yes	Depending on the email server you are using this has to be an existing email address.	100
Subject	Optional	Can be anything you want it to be.	100
SMTP server	Yes	has to be setup according to the requirements of the email server.	100
SMTP server port	Yes	Standard value for most servers has already been entered, but has to be setup according to the requirements of the email server.	
User name	Optional	Optional a User name can be entered if the SMTP server requires it. Click on "SMTP-Username and password" first.	50
Password	Optional	Optional a User name can be entered if the SMTP server requires it. Click on "SMTP-Username and password" first.	50

When you have filled in all server parameters, click on "Save". The settings can be tested by clicking on "Send test email with saved settings".

Save the settings first before sending the test email!
It might take a couple of minutes before the test email has been received by the recipient.
If the test-email has not been received, please check if it has been blocked by a Spam filter.

4.10.1 Troubleshooting

- ❑ Check if COMbricks has access to the internet. You can easily test this by going to the Download page in the COMbricks menu and download a datasheet from the web.
- ❑ Compare the DNS settings with the requirements of the email server you are using.
- ❑ Make sure your email server supports unsecured connections.
- ❑ Check the email settings and generate the test email. Start with only 1 email address (To).
- ❑ If the test email works, please check that your events have been correctly enabled and an event is really triggered.

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5 ProfiTrace OE

ProfiTrace OE (Over Ethernet) is a web based version of ProfiTrace. It offers the basic functionality of regular ProfiTrace, like; Live List, Statistics and Message recording. ProfiTrace OE is available on the Head Stations 1B and 1C.

5.1 Live List

"*Colours make it easy…..*"

The Live List is a matrix that continuously lists all the available devices. It is directly visible which devices are 'troublemakers'. With different background colours, the status of the devices is displayed (see **Fig. 33**):

- Green: Device is in Data Exchange
- Yellow: Device is lost
- Red: Parameter fault
- Purple: Configuration fault
- No colour: On the bus but not in Data Exchange

The Live List can also generate the product name of the devices when a diagnostic message is captured (synchronized with the GSD library).

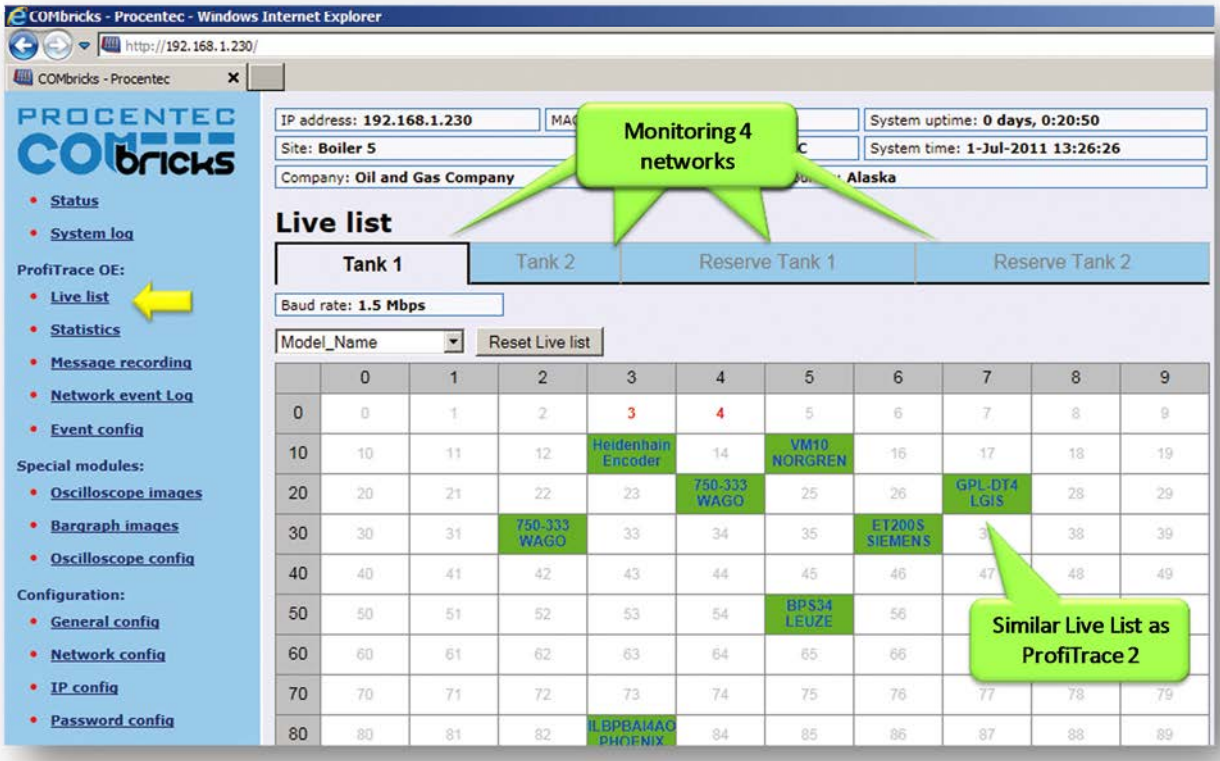

Fig. 33 - ProfiTrace Live List

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5.1.1 Updating the GSD file library

The procedure below describes how to update the GSD file information in COMbricks so that all devices in the Live List have a full model name.

STEP 1: Start regular ProfiTrace (2.6.x and no license required).

STEP 2: Copy all GSD files you require to the ProfiTrace GSD directory.
This is usually ".....\ProfiTrace_Vx_x_x\GSD".

STEP 3: Create a COMbricks GSD library.
(Settings > Create COMbricks GSD library)
A question is asked if you want to re-scan the GSD files. Select YES followed by (re)Scan GSDs. Click close when the process has been finalized.

STEP 4: A pop-up box allows us to select the destination folder. Select a (temporary) destination folder for the file *GSD.BIN*, for example the Windows desktop.

STEP 5: GSD.BIN has to be copied to the SD card of the COMbricks. You can do this by inserting it in your PC or FTP (admin account).

STEP 6: After inserting the SD card back in the Head Station or closing the FTP session, the GSD information is directly available in the Live List. **Paragraph 9.1** describes a method of testing the updated GSD.BIN.

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5.2 Statistics

"Click and go….."

The statistics matrix is the most powerful feature of the analyzer. This field can really indicate what the condition of the installation is. It displays all the important information that a user, especially a maintenance technician is really interested in (see **Fig. 34**):

- Retry messages
- Fall-outs
- Diagnostic messages
- Location of the connected devices, etc.

Paragraph 5.8 describes the statistics and when they occur.

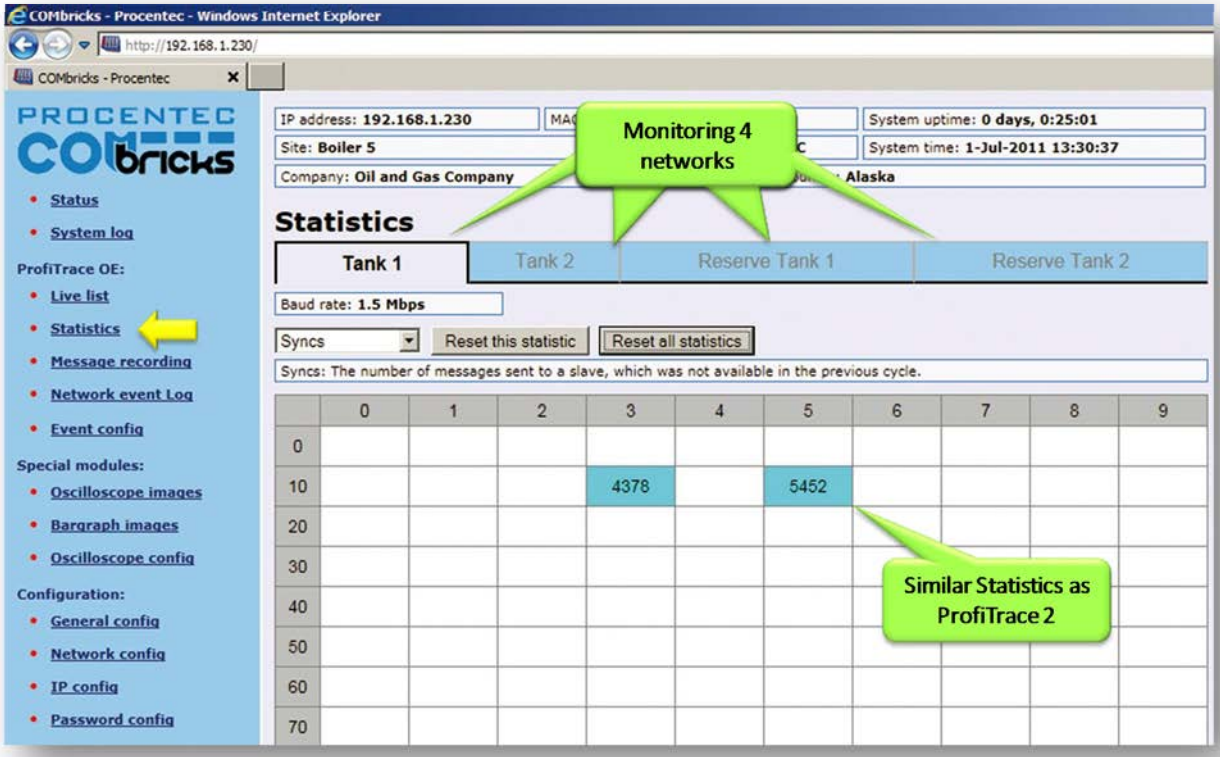

Fig. 34 - ProfiTrace OE Statistics

Because of this feature, the user does not have to inspect messages or do difficult operations to ensure the quality of the installation.

If the statistics do NOT show deviations, the installation is on the 1st degree OK!!!

Here it stops for the technician who is only interested in a quick feedback. The advanced technician can proceed with a message recording and an inspection of the signal quality.

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5.3 Message recording

"Catch it all....."

The message recording in ProfiTrace OE has a different strategy than ProfiTrace 2. Within ProfiTrace 2, the use had to setup the message recording first and is responsible to start it.

Because COMbricks is a unit for permanent monitoring, it automatically starts a message recording when an event has been detected. The following event automatically starts a message recording again.

When the unit is purchased or reset, it is automatically triggered on the statistic "Lost". This works directly after powered ON. The user can change the settings during operation (see **Fig. 35**).

The recorded files can be opened with an offline ProfiTrace 2 (no license required).

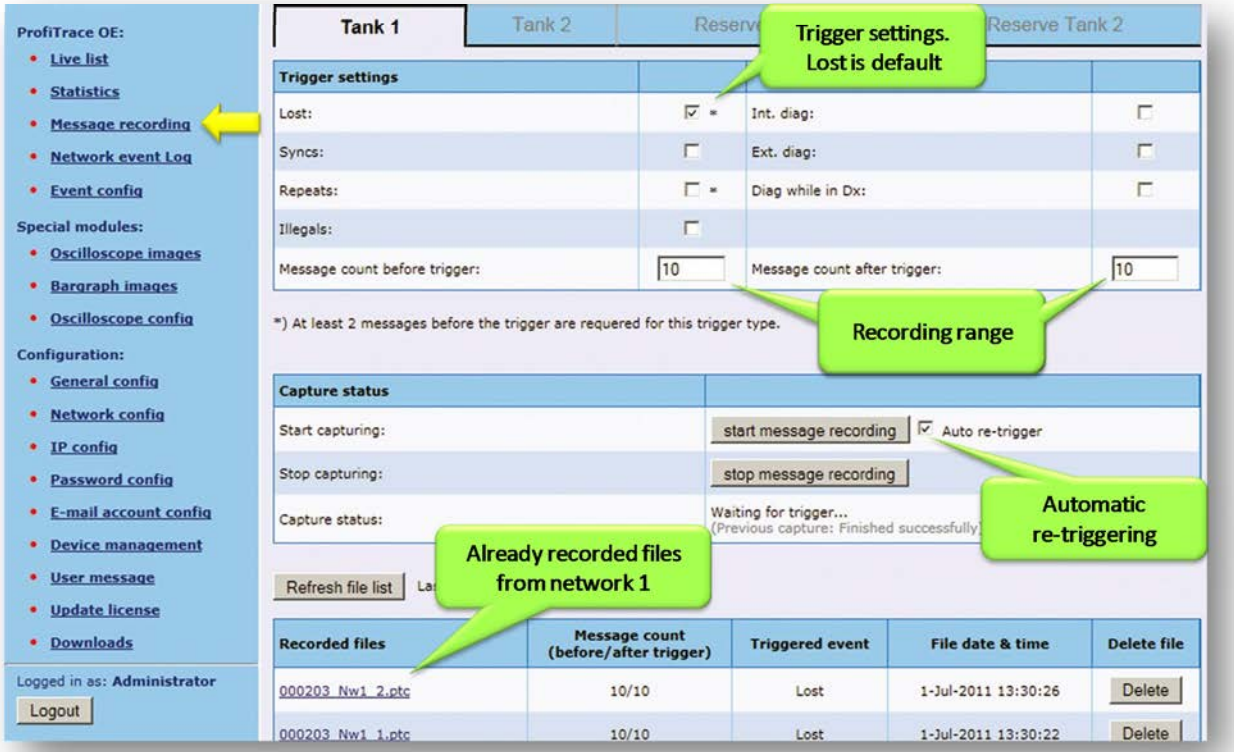

Fig. 35 - Setup recording trigger

The automatic triggering can generate 10 *.PTC* files per network. After 10 files have been generated, the follow-up event will delete the oldest file and replace it with the latest event. This system secures the storage space of the SD card.

.PTC files can be opened with ProfiTrace 2.5.3 and higher (offline and no licenses required).

The file name contain the MAC address of the Head Station, the network number and the file number (1-10).

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5.4 Event configuration

For the generation of emails and entries in the network log, the event configuration has to be set (for each network). **Fig. 36** shows an example with multiple event options.
Paragraph 5.8 describes the events and when they occur.

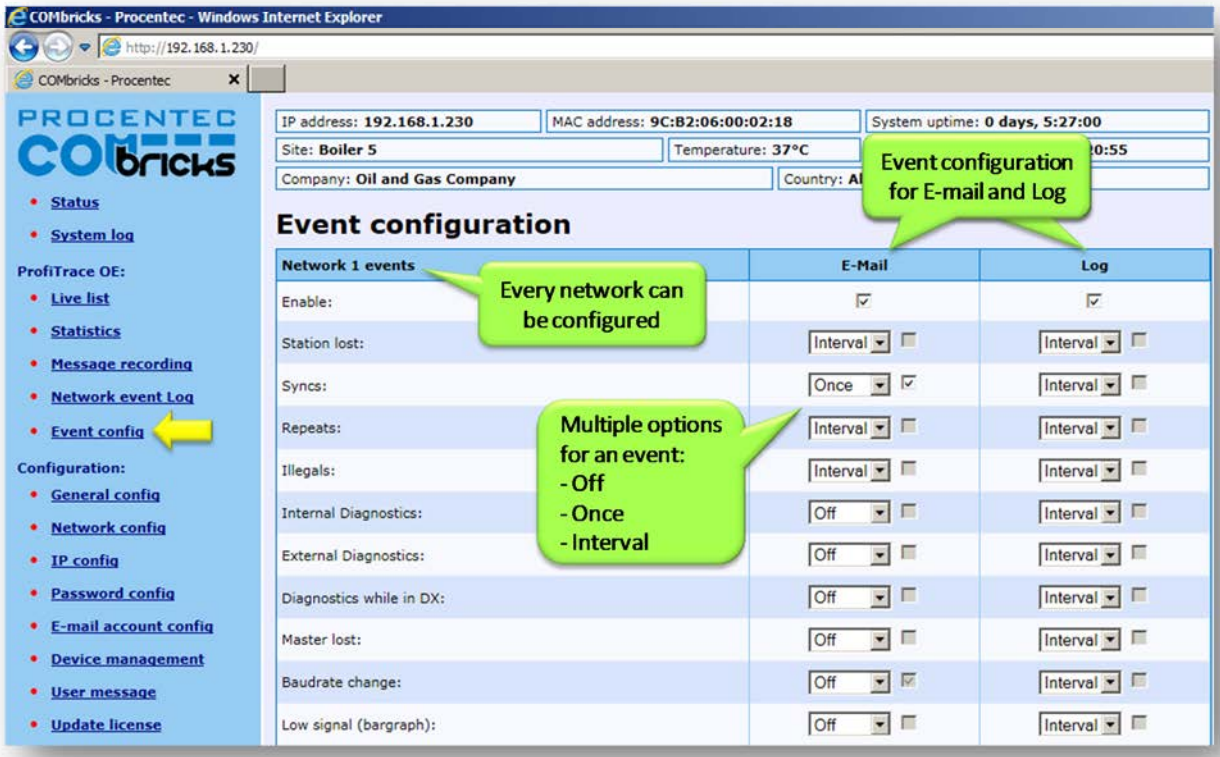

Fig. 36 - Event configuration

To reduce an unwanted overload of emails or log entries, the events can be set to Off, Once or Interval.

Even parameter	Description	Retrigger required
Off	No event generation.	
Once	Event will be generated once (1-shot).	Yes
Interval	Event will be generated once within the customized interval time. During the interval time the event is automatically retriggered to be generated in the next interval.	No

The interval time can be customized between 1 second and 24 hours.

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5.5 Oscilloscope images

"The easiest PROFIBUS oscilloscope ever....."

SCOPE repeater modules have an integrated oscilloscope to measure the signal quality of the telegrams. The oscilloscope has an interface with the web server to display the signals from the devices which are connected to its channel. After opening the web page, all oscilloscope signals are displayed and updated live.

The SCOPE repeater is the most easy to use PROFIBUS oscilloscope available:

- You do NOT have to touch the installation
- Works automatically
- Oscilloscope data is never mistaken with the wrong segment
- No probe wiring
- No spur lines

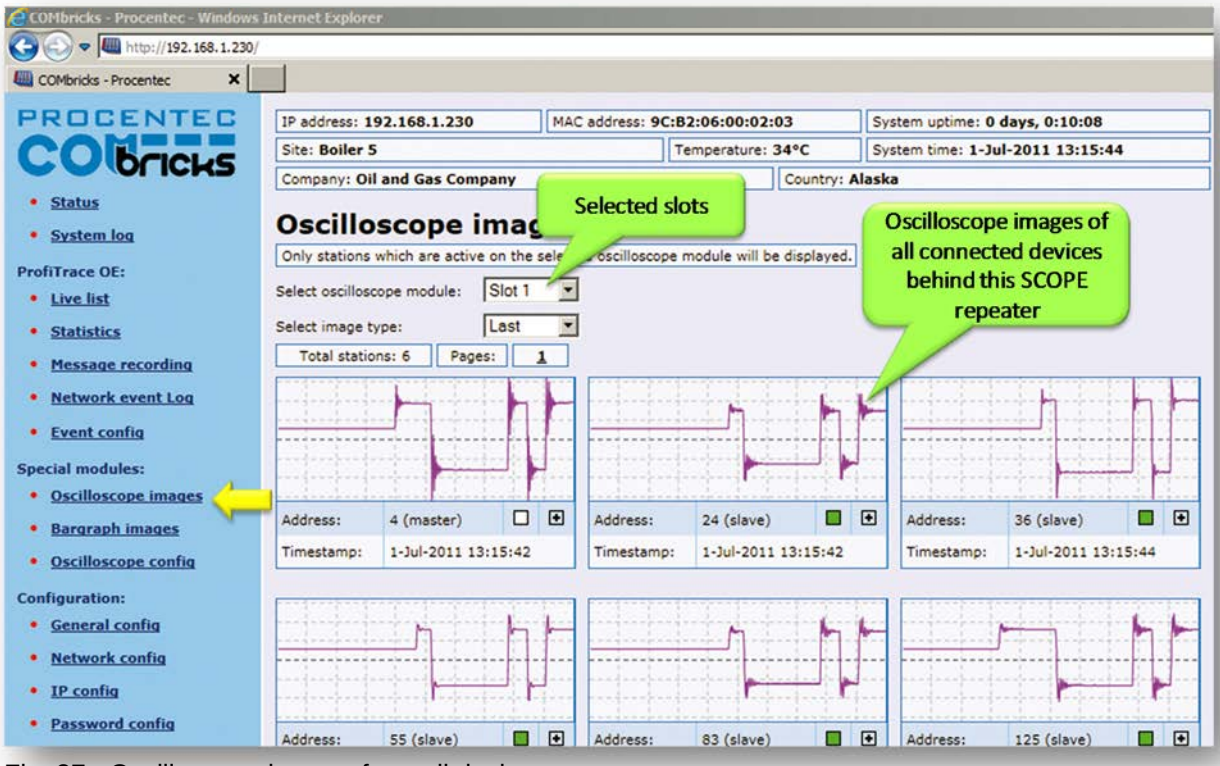

Fig. 37 - Oscilloscope images from all devices

By double-clicking on a device, the oscilloscope triggers on the respective device and only displays its signals in a new page.

The SCOPE repeater is only able to do differential measurements.

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5.6 Bar graph

The Bar graph illustrates the average signal strength from all available connected devices behind a specific SCOPE repeater. It is a helpful utility to get an impression of the overall signal quality of the network.

The average amplitude should be around 5 V. When there are bus problems the Bar graph will display different Voltage levels and the colour of the bars will change.

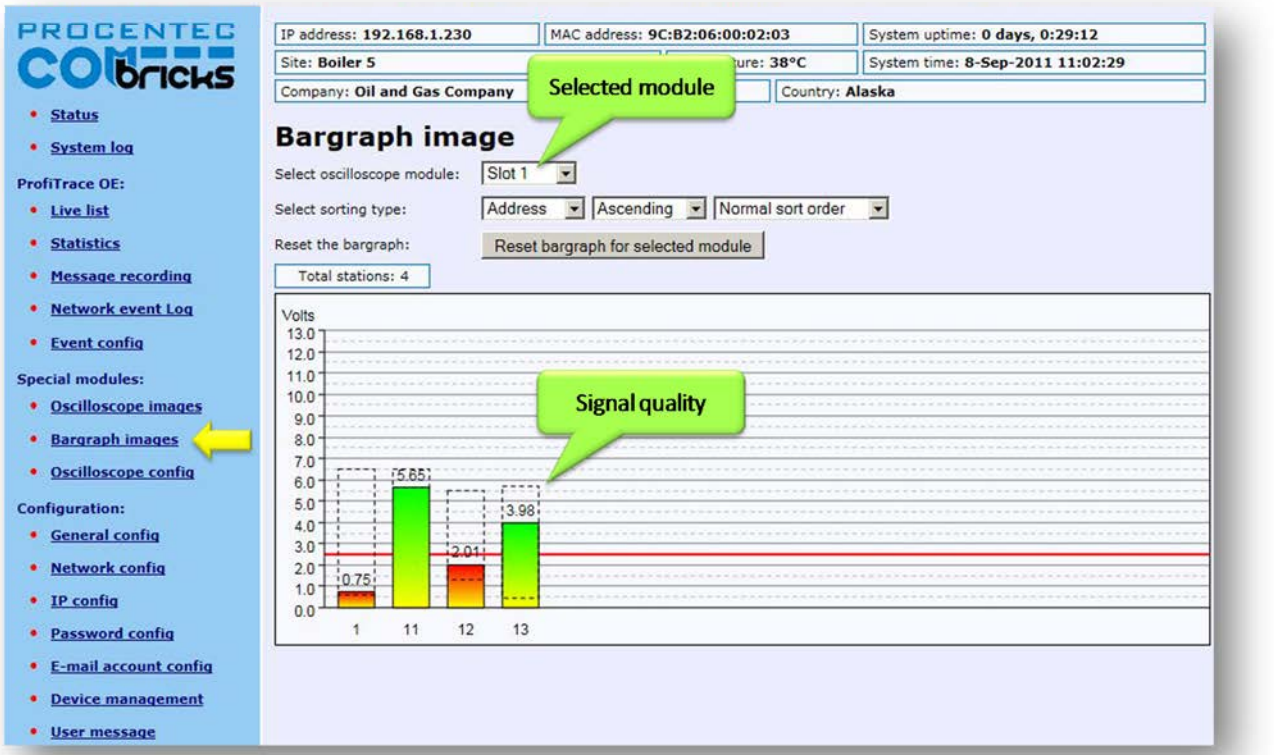

Fig. 38 - Bar graph

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5.7 Streaming with ProfiTrace 2

Streaming with ProfiTrace 2 is a feature that allows the user to use the familiar ProfiTrace 2 software and create a scenario as if a ProfiCore is connected to the PC. A license for ProfiTrace 2 is NOT required!

Streaming with ProfiTrace 2 only works under the following circumstances and settings:

- Only Head Stations Type 1C with firmware V1.253 or higher
- Max. 1.5 Mbps (PROFIBUS)
- Clean TCP/IP connection
- ProfiTrace 2.6.0 or higher
- Only 1 COMbricks connection

After successfully installing ProfiTrace 2, you can find a '*ProfiTrace v2.6.x for COMbricks*' in the start menu of Windows (see **Fig. 39**).

This is the standard ProfiTrace2.exe, but with an additional parameter; ProfiTrace2.exe" -_CBMODE_

After Starting '*ProfiTrace V2.6.x for COMbricks*' ProfiTrace will initially look very similar to the regular version, but now with a reduced number of program option tabs offered near top of screen. The usual ScopeWare, Bargraph, Topology, ProfiCaptain and other tabs/menus are missing to the right of the single ProfiTrace tab (see **Fig. 39**).

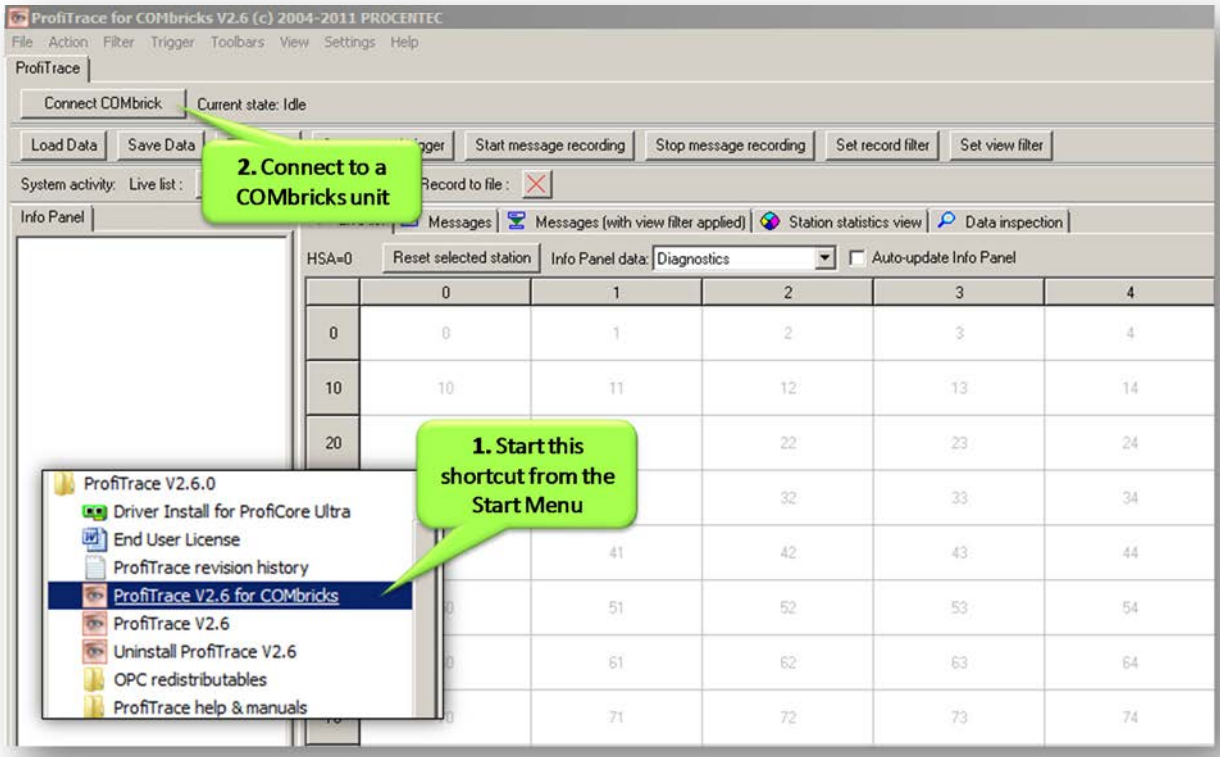

Fig. 39 - Starting ProfiTrace 2 for COMbricks

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After clicking on the 'Connect COMbricks' button, a mid-screen dialogue is displayed which is used to setup the connection with COMbricks (see **Fig. 40**).

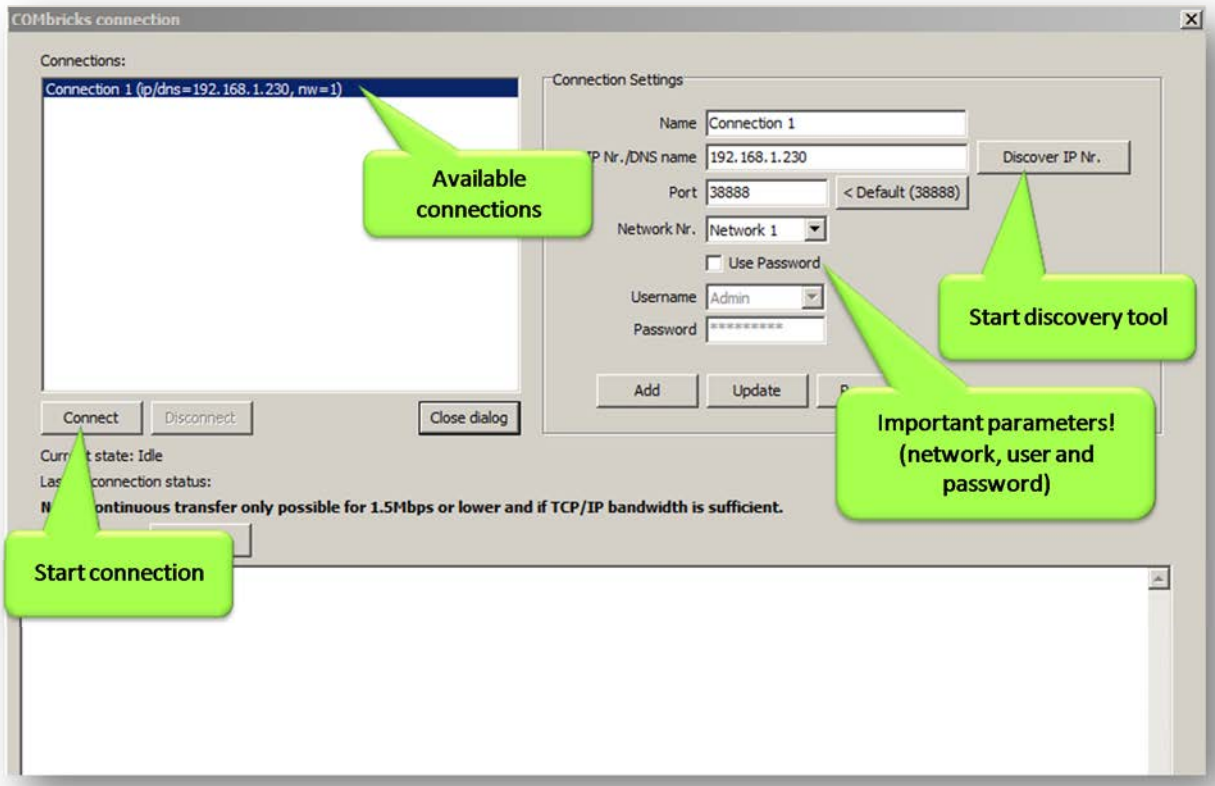

Fig. 40 - Setting up the connection

Important parameters for the connection and the streaming process:

- IP number
- User type and password
- Network number

If one of the connection parameters is incorrect, the connection will not be established or no data is streamed. It is recommended to start the discovery tool to verify the IP connection.

Multiple connection instances can be saved and loaded each with their own connection parameters.

COMbricks itself can handle 1 connection, but on the PC multiple ProfiTrace instances can be opened that simultaneously communicate with COMbricks units.

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5.8 Summary of Statistics and Events

This paragraph contains a description of the items listed in the statistics and/or events.

Statistics	Description	Critical
Lost	How many times a device in data exchange fails to respond after the maximum retries have been reached. Lost is retriggered when the device recovers back to data exchange and fails to respond again. - Live List will indicate a yellow colored address. - When the device was already lost after the activation of ProfiTrace Lost will not be updated. Only Syncs will indicate the problem.	YES
Syncs	Attempts the master is trying to contact a device for the first time or establish a communication relationship. This occurs in most cases after station lost, device unavailability or startup of the master. In the statistics view this values adds up relatively quick. - Some DCS systems read diagnostics all the time with Syncs ON. - Live List could indicate a yellow colored address.	YES (in most cases)
Repeats Total	Another attempt to get a response from a telegram (retry). The response did not come or has content errors. The maximum amount of repeats a master attempts has to be customized in the master. - When the retries have reached the limit, the master goes to the Syncs state	YES
Repeats Worst Case	This value represents the highest amount of retries that were attempted on this specific device. - This value will never get higher than the retry value that has been setup in the master.	YES
Illegal Responses	The response to a master request telegram contains framing errors (parity error, wrong FCS, SD error, etc). This mostly happens with EMC and cabling problems. - When this statistic adds up relatively quick, it could also be a double device address.	YES

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Statistics	Description	Critical
Internal Diag	Negative responses at the lowest telegram level (Layer 2: FDL) and are rare. In the telegram recording you will see SD1 telegrams with for example an RS (Reject Service) or RR (Reject Resources). Examples of situations where this occurs: - DP-V1 connections to DP-V0 devices. - Watchdog has run out on a DP devices and the master sends a Data exchange output telegram. - Non-certified DP devices that do not support a specific service/command or cannot handle a command in time.	NO
External Diag	All responses from Get Diagnostics requests from all masters.	NO
Diag while in DX	Only the responses from Get Diagnostics requests from the master that controls this slave (primary class 1 master). - When the first 2 bytes of the diagnostic content contains a 08 0C or 08 04, a red indicator blinks in the left corner of the device in the Live List (critical content).	YES (in most cases)

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6 Head Station 1A/1B/1C

The Head Station is the primary element of COMbricks and has to be inserted in the most left slot of the fixed backplane socket. It schedules the interaction between all modules and provides data storage and an Ethernet interface for the user.

6.1 Overview

Type 1A is the basic model and ALL Head Stations are hardware technically identical with type 1A.

Type 1B and 1C are enhanced types that contain a ProfiTrace core and advanced web server for permanent remote maintenance of the PROFIBUS installation over Ethernet (hardware is identical as a type 1A).

- Type 1A: NO monitoring capabilities
- Type 1B: Monitors 2 PROFIBUS networks
- Type 1C: Monitors 4 PROFIBUS networks + ProfiTrace 2 streaming + OPC

For the monitoring with ProfiTrace OE, repeater modules or slave modules are required to provide PROFIBUS telegrams on the backplane network.

Head Station type 1C is also able to stream live data directly in the ProfiTrace 2 software package over Ethernet. ProfiTrace 2 will run with full monitoring functionality and the user can benefit from its features.

The Head Station provides power to all modules through its redundant power supply.

Table 3 - Head Station comparison

	Head Station 1C (101-20011C)	Head Station 1B (101-20011B)	Head Station 1A (101-20011A)
Backplane networks (for repeater modules)	4	4	4
ProfiTrace OE networks (for monitoring)	4 (**ALL networks**)	2 (**network 1 and 2**)	-
CommDTM / Class 2 master	YES	YES	YES
ProfiTrace 2 live streaming	YES	-	-
OPC	YES	-	-

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6.2 Relay contact

With the relay contact it is possible to react on an event (retries, lost, bus voltage too low, etc). It is also possible to control the relay manual or on a timer. In the web server the behaviour is customized. The relay is capable of switching 1A - 250 VAC.

6.3 Audio jack

Not supported yet.

6.4 SD card

The SD card is used to store ProfiTrace file recording data, logs, the GSD info file and backup settings.

By default a 2 GB SD card is delivered together with the Head Station, but it can be exchanged by an SD card with a maximum size of 32 GB.

The SD card is directly approachable with FTP. In the FTP software the SD card will become a drive with a directory structure on which files can be read and written to the SD card. When the password is set in the web server, this same password has to be used by the FTP software to make a connection.

6.4.1 Inserting/replacing the SD card

The socket is located on the front plate of the Head Station.

To remove the SD card, gently press it downwards. The SD card is unlocked and released from the socket.

With insertion, just insert the SD card in the socket and press it down. The SD card socket has a polarity to make sure it is not inserted backwards.

The SD card is hot swappable, but there is a risk that monitoring data is lost when the system wants to write at exactly the same time as the removal or insertion.

6.4.2 Life cycle of the SD card

The life of a SD card depends on the following factors:
- Number of read and write operations
- Ambient temperature

At an ambient temperature up to 60 °C the SD card has a service life of 10-years at maximum 100000 write/delete sequences.

If the maximum number of read and write operations has exceeded the limits, data loss is possible.

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6.4.3 Directories and files

The following directories have been standardized for COMbricks and are in most cases located on the SD card;

Directories	Description
/Busmon	ProfiTrace message recoding files (Head Station type 1B and 1C only)
/Log	Log files
/Doc	Contains the web server download page (See **Paragraph 4.9** on how to set it up)

Files and extensions	Description
Journal.DAT	System file (Do not delete or remove it)
GSD.BIN	File with GSD information for the Live List. (Generated with the ProfiTrace 2 software). See **Paragraph 5.1.1** how to generate this file.
SETTINGS.INI	Head Station settings (IP address, name, location, etc.)
LICxxxxxxx.TXT	License files
.PTC	ProfiTrace OE message recoding files. (located in the "*Busmon*" directory). The files can be opened with ProfiTrace V2.5.3 and higher (See **Paragraph 5.3** on how to generate PTC files).
.PKG	Firmware files
.CSV	Log files (located in the "*Log*" directory)

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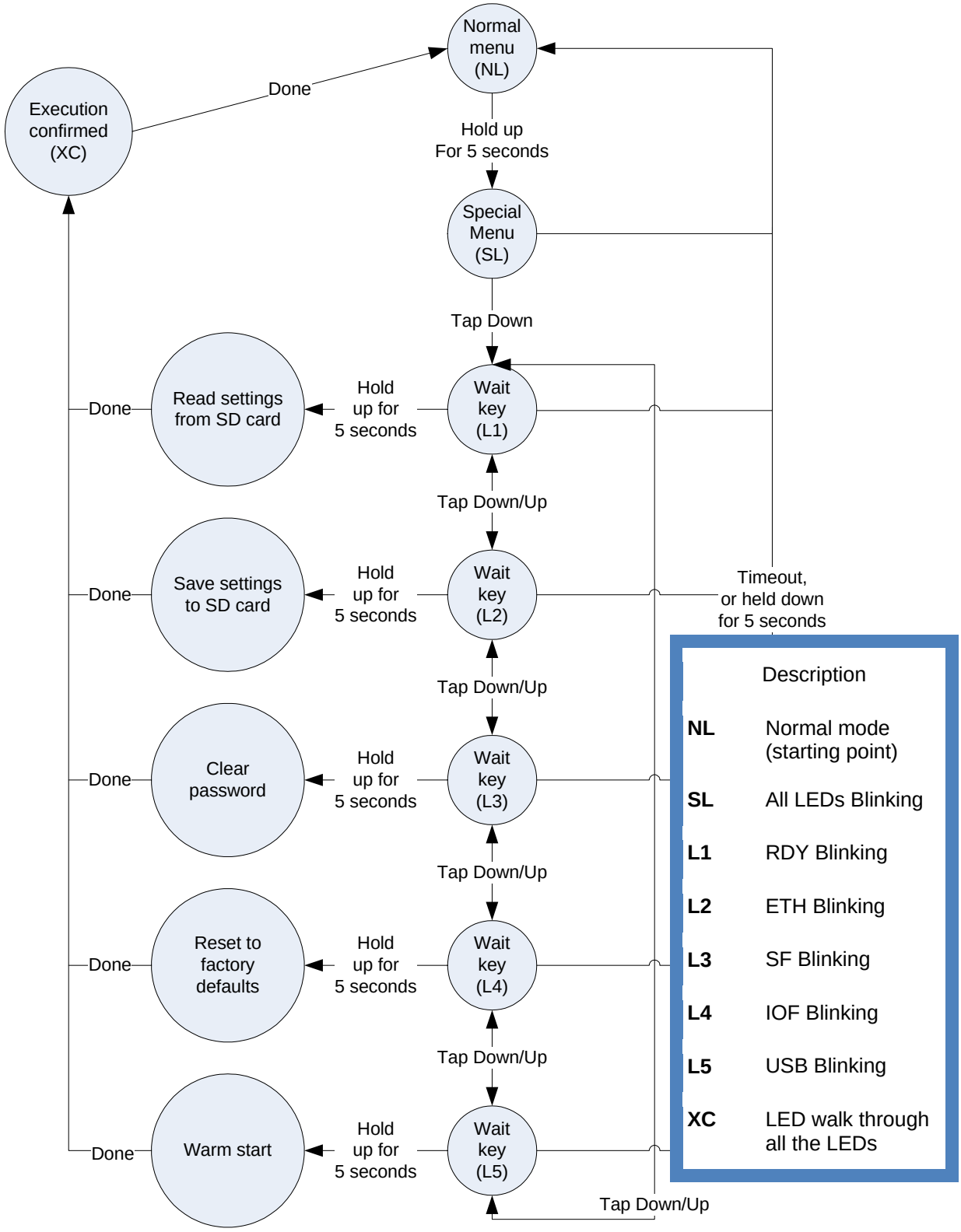
6.5 Switch navigation of the Head Station 1A/1B/1C



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6.6 LEDs on the Head Station

In the tables below the LEDs of the Head Stations during normal operation are described. The LED conditions in firmware update and menu mode are not described here.

RDY - Ready	OFF	Blinking	ON
Starting up		X	
Run			X

ETH - Ethernet	OFF	Blinking	ON
No Ethernet link established	X		
DHCP configuration is pending		X	
Ethernet link established			X

SF - System failure on the Head Station	OFF	Blinking	ON
OK	X		
Backplane voltage too low (under 5,5 VDC) or current draw to high (above 2,5 A)		Fast	
Clock-chip error *(contact your local Distributor or PROCENTEC)*		Slow	
Internal component or firmware error *(contact your local Distributor or PROCENTEC)*			X

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IOF - Failure on modules	OFF	Blinking	ON
OK	X		
High speed module in slot 11-32			X
More than 32 modules found			X
Module NOT identified			X

USB - Mini USB connecting	OFF	Blinking	ON
No USB connection	X		
USB connection			X

SD card	OFF	Blinking	ON
No SD card inserted	X		
SD card inserted (activity)		X	
SD card inserted (no activity)			X

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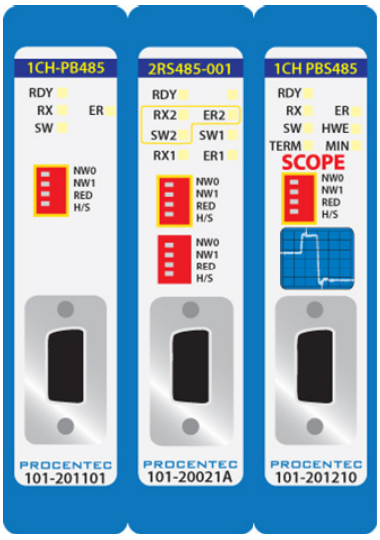
7 Repeater modules (RS 485)

The standard RS 485 PROFIBUS repeater modules can be a 1 or 2 channel type. Suitable for 12 Mbps with screw terminals, additional DB9 connector, onboard termination, diagnostic LEDs and redundancy feature.



The advanced 12 Mbps core of the repeater module is identical as the ProfiHub and repeater B1; it can be cascaded unlimitedly and has increased RS 485 strength. It does not have the frustrating short-circuit bug and the bus communication is constantly monitored for glitches which are digitally filtered out. Every channel has on-board switchable termination and able to drive 31 devices.

The repeater channels are directly connected with the ProfiTrace OE core in the 1B/1C Head Station. Busmonitor data is directly available in the web server.

10 Repeater modules can be inserted in the backplane. This is independent of the amount of channels on the repeater modules.

	1CH Repeater module (101-201101)	2CH Repeater module (101-201102)	1CH SCOPE Rep. (101-201210)
Channels	1	2	1
Networks	4	4	4
Redundancy	YES	YES	YES
ProfiTrace (busmonitor)	YES	YES	YES
Oscilloscope (bus signals / bargraph)	NO	NO	YES
Intrinsically safe	NO	NO	NO

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7.1 Multiple channels per module

Repeater modules contain 1 or 2 channels. **Fig. 41** illustrates a 2 channels repeater module. Every channel can be assigned to a specific backplane network by means of the NW dipswitches or the web server.

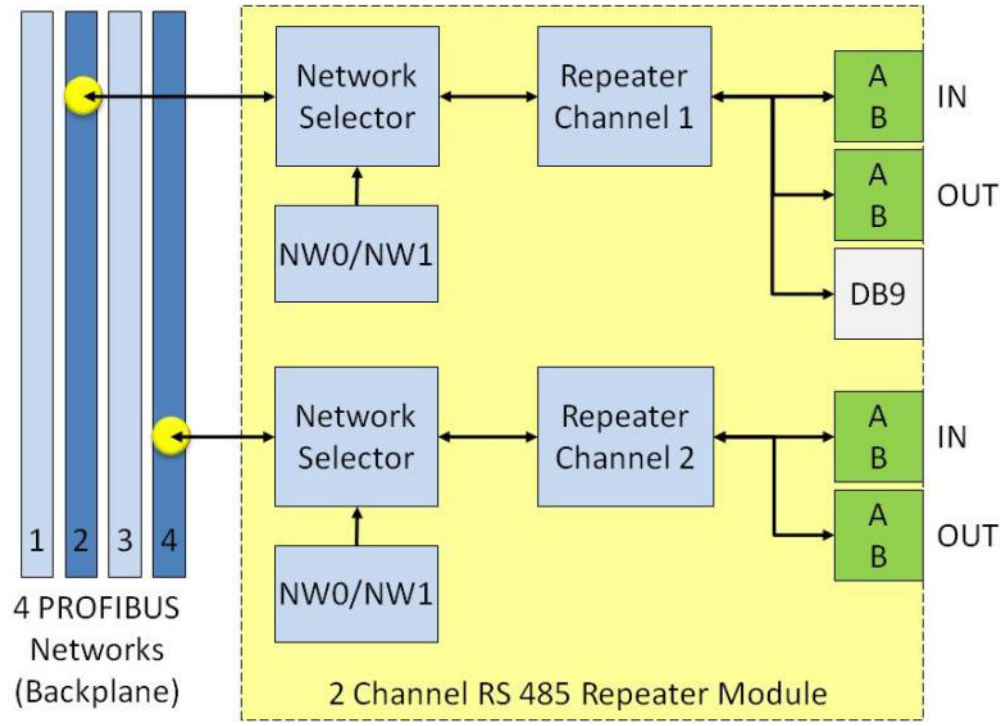

Fig. 41 - Multiple channels per module

ProfiTrace OE is able to monitor 4 PROFIBUS networks with 2 x 2 channel repeater modules.

The DB9 connector is 1-on-1 with all connectors of channel 1 (see **Fig. 41**).

7.2 Channel structure

Every Channel is electrically isolated and internally connected to the transparent PROFIBUS networks on the backplane (see **Fig. 42**).

The shielding of the PROFIBUS cable can be directly grounded or indirectly grounded (see **Paragraph 7.4**).

The termination is switchable and powered by the repeater module. A LED on the front or the web server diagnostics indicate the status of the termination switch.

When the termination is switched ON, the OUT connector of the specific channel is disconnected. If it is activated on Channel 1, the DB9 connector is NOT affected.
A possible termination on the connected plug could jeopardize the communication on the segment.

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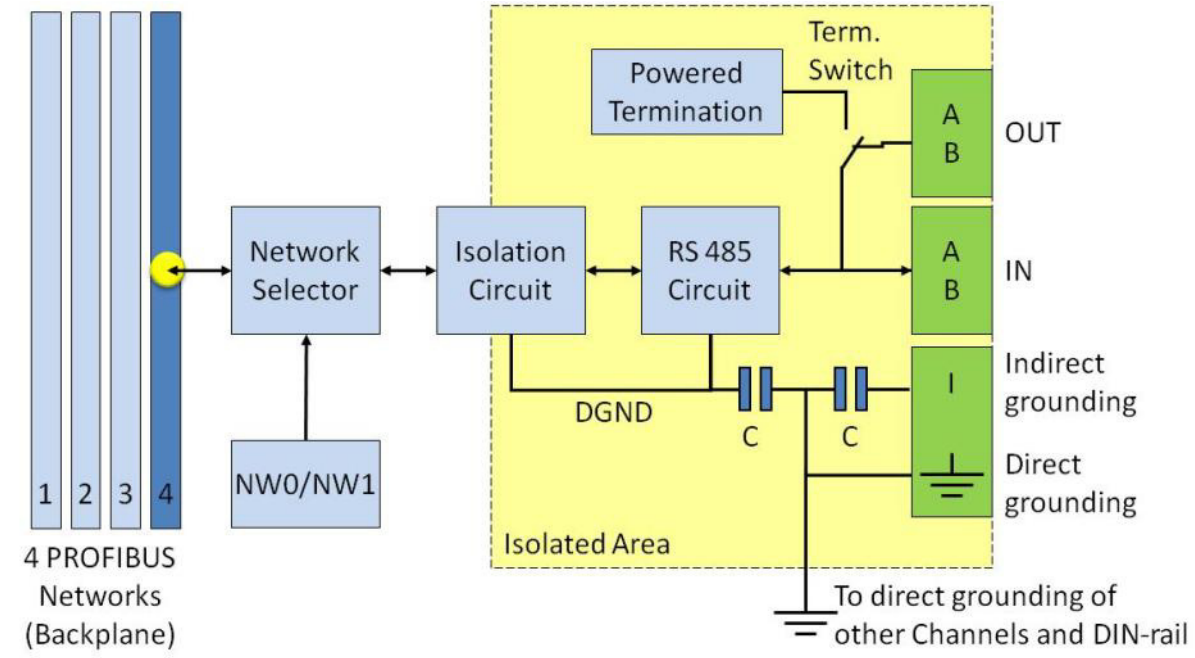

Fig. 42 - Channel structure of the repeater modules

7.3 EMC barrier

The galvanic isolation and bit recovery circuit in the repeater modules, make the COMbricks perfect to act as an EMC barrier for sensitive areas.

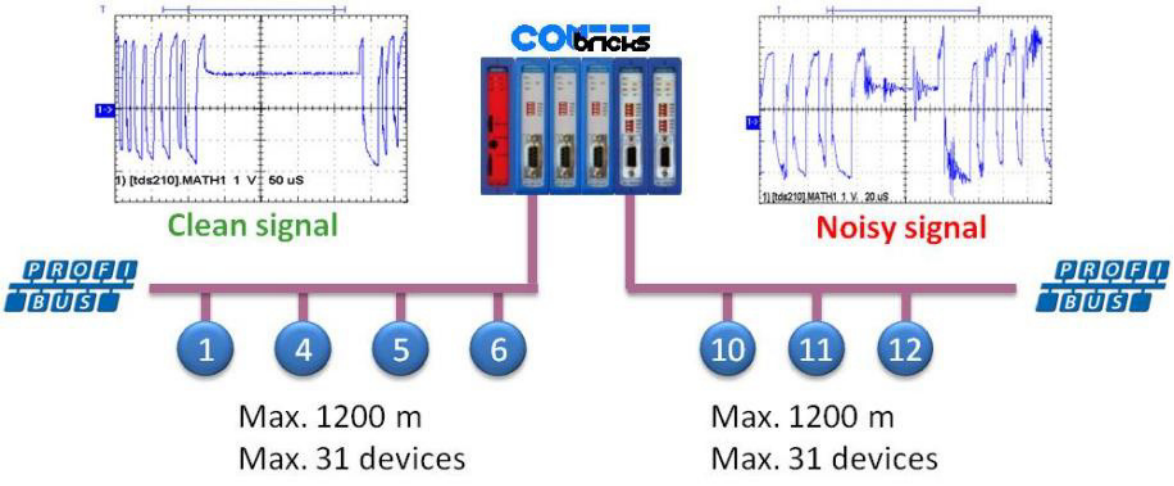

Fig. 43 - COMbricks as EMC barrier

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7.4 Grounding system

There are 3 methods to ground the PROFIBUS cable:
1) Direct grounding
2) Indirect grounding (through a capacitor)
3) Combination of direct and indirect.

In most cases it is recommended always to use Direct Grounding with the power supply and the shielding of the PROFIBUS cables. If you do not want to ground all or some cables to the common ground, the cable shielding should be connected to pin 'I'. A capacitor with a parallel high value resistor will separate the 2 potentials (see **Fig. 42**).
If by accident the Direct Grounding is connected with the Indirect Grounding, the Direct Grounding "wins".

7.5 Baudrate detection

The repeater module requires less than 10 seconds to detect the baudrate. The detection is initiated from the data that enters the module from the connectors (not the backplane). If the baudrate has been detected, the 'ER' LED will be OFF.

Within 50 seconds a valid telegram has to be recognized otherwise the repeater module unlocks the baudrate and the 'ER' LED will be ON.

7.6 PROFIBUS DP cable lengths

The length of the PROFIBUS cable connected to the repeater channels should comply with the PROFIBUS DP cable specifications for RS 485.

Baudrate (kbps)	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Segment length (m)	1200	1200	1200	1200	1000	400	200	100	100	100

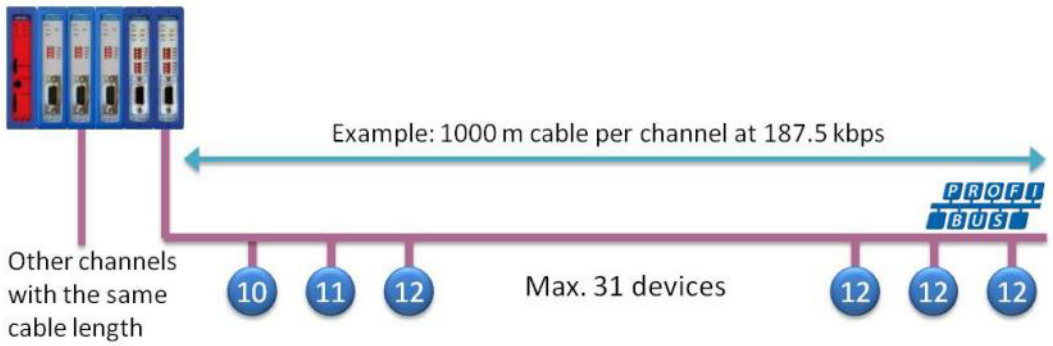

Fig. 44 - PROFIBUS DP cable lengths

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7.7 PROFIBUS DP cable specifications

The cable should comply with the PROFIBUS DP cable specifications for RS 485.

Table 4 - PROFIBUS DP cable specifications

Parameter	Value	Parameter	Value
Wires	2 (twisted)	Wire diameter	≥ 0.64 mm
Impedance	150 Ohm (3 to 20 MHz)	Wire area	≥ 0.32 mm^2
Capacity	≤ 30 pF/m	Shielding resistance	≤ 9.5 Ohm/km
Loop resistance	≤ 110 Ohm/km		

7.8 PROFIBUS DP cable types

The repeater modules can handle PROFIBUS cable based on multiple protection sheaths with a diameter between 6 to 12 mm (when the grounding clip is used).

- Robust cable
- Food cable
- Ground cable
- Trailing cable
- Festoon cable
- Fire and heat cable
- Flexible cable
- Shipboard cable
- Rodent protection cable

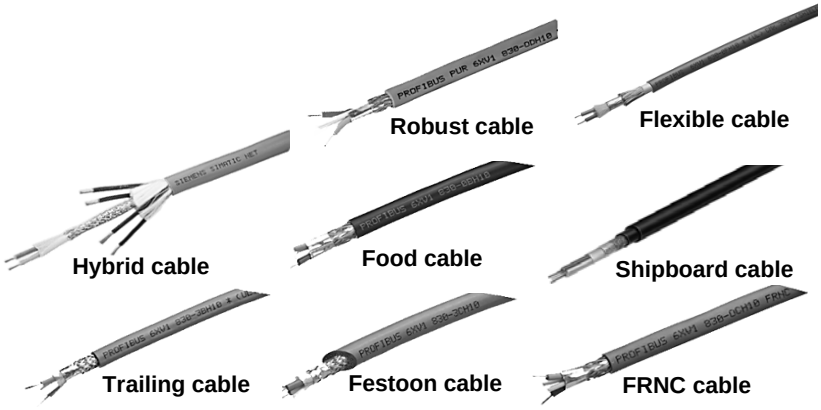

Fig. 45 - Supported PROFIBUS cable types

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7.9 Redundancy

The bus redundancy technology of the repeater modules is very advanced. A redundant system can be built using 10 parallel cables. This architecture provides extremely high availability. It is compatible with the RLM01 from ABB.

The redundancy procedure is very simple;
All the repeater channels of the specific application have to be assigned to the same network group. The repeater channels that carry the redundant task have to be activated with the RED switch. After a reset or power-up the system works directly.

COMbricks locks itself to the first redundant channel that has a valid start delimiter.
If this channel does not have valid telegrams anymore, COMbricks locks itself to the next redundant channel with a valid start delimiter. There is no logic which redundant channel is selected.

It is recommended to use 1 channel repeater modules for redundant applications. If a module should fail the replacement (pull/plug and wiring) will not interfere with the other redundant repeater modules (channels).

Fig. 46 illustrates an application with 3 redundant segments. 3 Repeater modules of each COMbricks are set with the RED switch set to ON and are wired to the redundant segments.

The devices and the controller(s) are connected to the regular repeater modules. The maximum amount of devices which is allowed behind a regular repeater module depends on the application (between 1 and 31 devices).

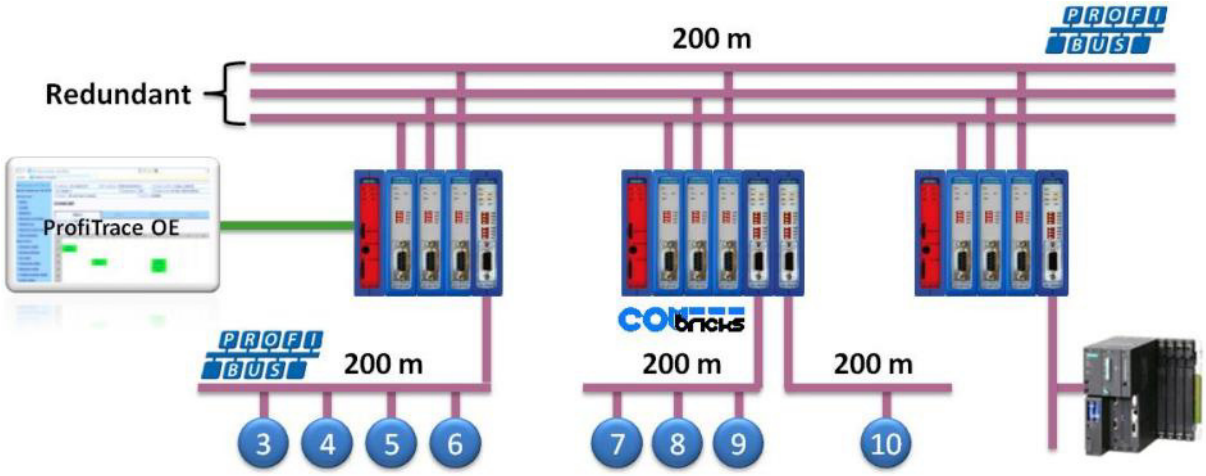

Fig. 46 - Application with 3 redundant segments

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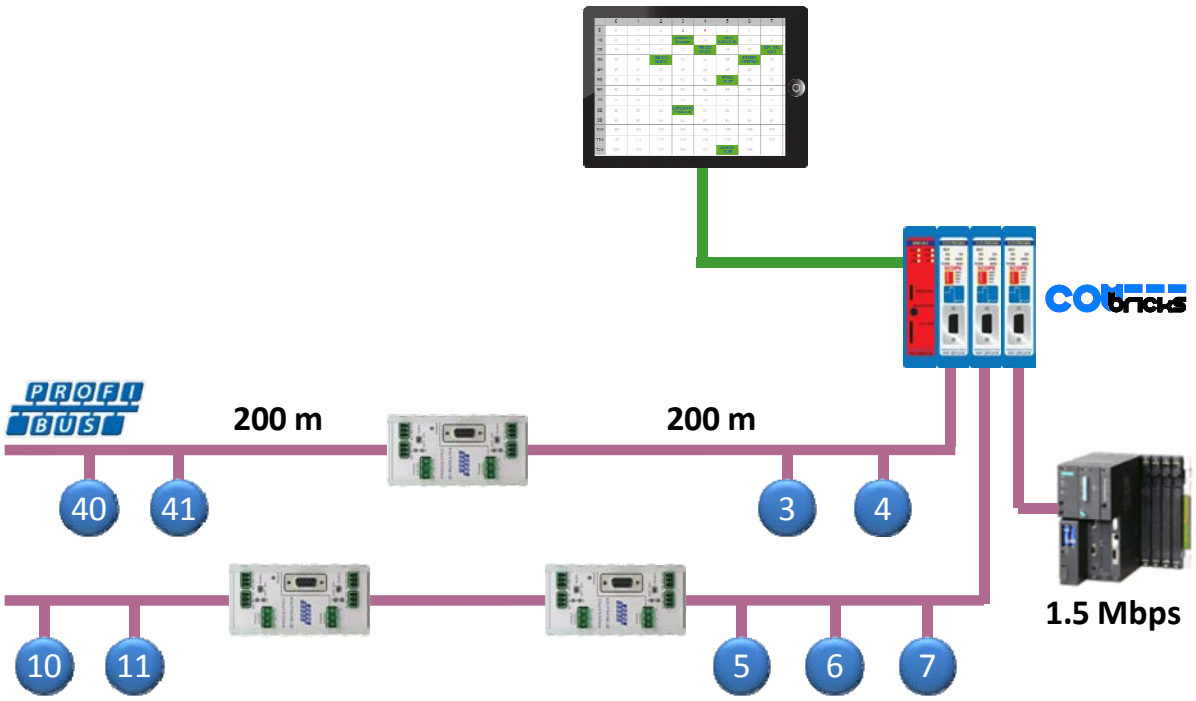
7.10 Mixing with other repeaters

Normally it is advised not to mix regular repeaters because of the limitation in cascading that these repeaters have (caused by the bit width alteration due to internal opto couplers and digital electronics).

COMbricks regenerates the telegrams (same as a ProfiHub or B1 Repeater). This means there is just a little delay time, but no limitations in cascading!
If you mix COMbricks with other repeaters you only have to follow the cascading rules of the other repeater manufacturer. If the other repeaters are also from PROCENTEC, you can cascade and mix without problems.

Keep in mind that monitoring will fully work, but the SCOPE repeaters only measure the signals up to the first repeater module.



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7.11 LEDs of the repeater module

The LEDs on the repeater modules are very useful for visual diagnostics.

Table 5 - LEDs on the standard repeater module

	OFF	Blinking	ON
RDY	☹ Repeater module has NOT been configured yet.	😐 Head Station is configuring the repeater module.	☺ Repeater module has been configured and is operational
RX	😐 NO valid telegrams detected on this channel.	☺ 1 or more devices are communicating on this channel.	☺ 1 or more devices are communicating on this channel.
ER	☺ The baudrate has been detected.	☹ Problem in the cabling has been detected on this channel.	☹ This channel has not detected the baudrate (yet) or there is a problem with the wiring of the cable.
SW	Internal termination for this channel is OFF.		Internal termination for this channel has been activated.

Table 6 - Additional LEDs on the SCOPE repeater module

	OFF	Blinking	ON
MIN	☺ Valid telegram signal amplitude (> 2.5 V)		☹ Telegram signal amplitude is too low (< 2.5 V)
TERM	☺ Valid idle voltage (~ 1 V).		☹ Idle voltage is too low (< 1 V)
HWE	☺ Repeater is operational.		☹ Internal repeater error (contact PROCENTEC)

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8 Firmware updates

New firmware and the firmware update tool can be downloaded from; **www.procentec.com/combricks**

Firmware files have the extension *.PKG*.

For updating the firmware a mini USB cable is required.

After downloading the firmware and installing the firmware update tool, follow the procedure below:

STEP 1: Shutdown ALL power to the Head Station (also USB cables and power modules).

STEP 2: Hold the menu switch of the Head Station down and at the same time provide power to the Head Station. In the firmware update mode the SF and IOF LEDs should be blinking.

STEP 3: Connect the mini USB to the Head Station (see **Fig. 47**).

Fig. 47 - Firmware update cable

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STEP 4:	Start the firmware update tool. If the tool detects the Head Station in the firmware update mode, the "Start update" button is enabled (see **Fig. 48**).
STEP 5:	Click on "Start update" to browse to the .PKG file and click "OK". The tool will now upload the new firmware to the Head Station.
STEP 6:	After the upload the Head Station will update the firmware. This can take a few minutes. **The window that appears be can closed directly**!
STEP 7:	Please verify the firmware update by checking the firmware version in the web server (bottom of each web page).

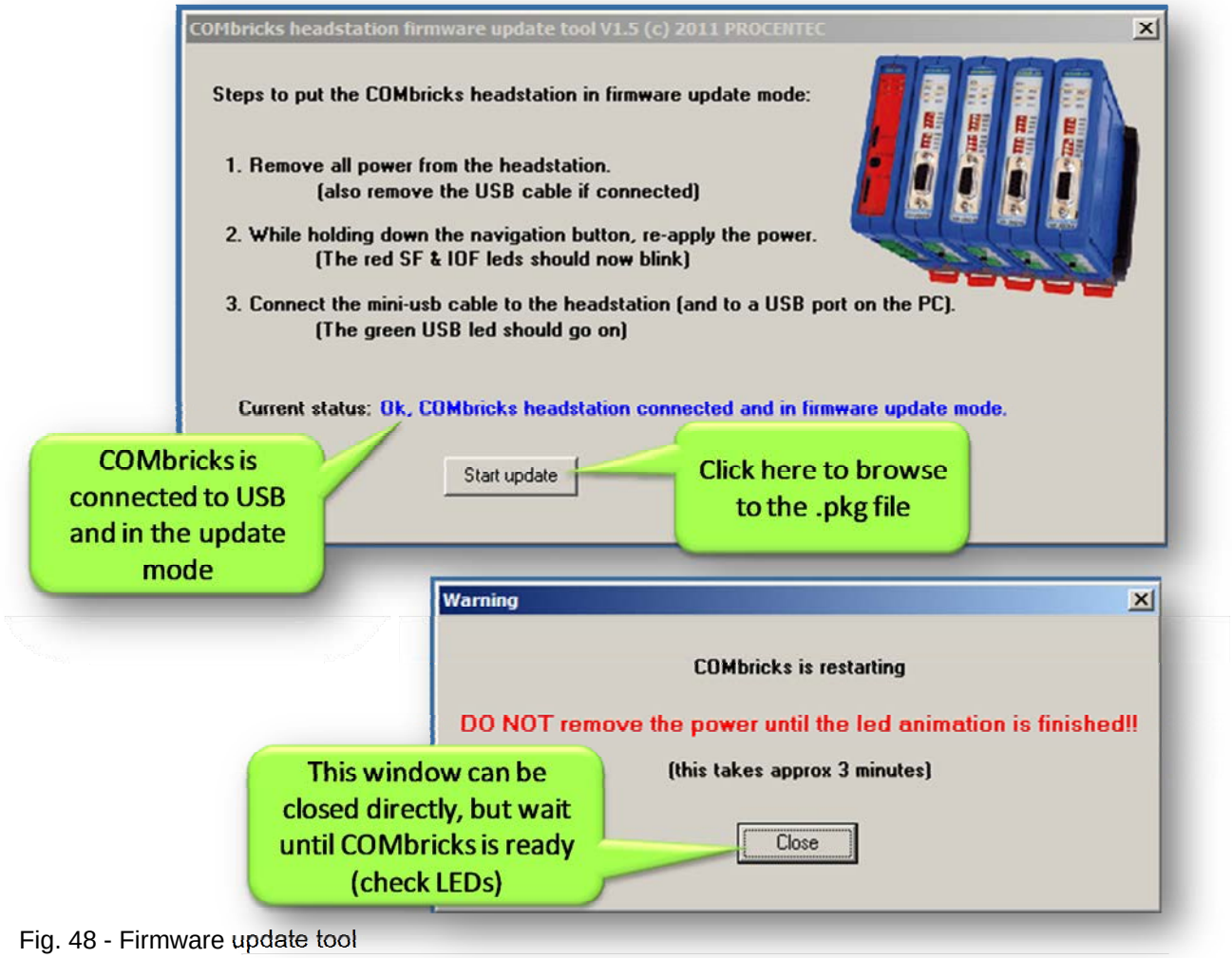
COMbricks headstation firmware update tool V1.5 (c) 2011 PROCENTEC
Steps to put the COMbricks headstation in firmware update mode:
1. Remove all power from the headstation.
(also remove the USB cable if connected)
2. While holding down the navigation button, re-apply the power.
(The red SF & IOF leds should now blink)
3. Connect the mini-usb cable to the headstation (and to a USB port on the PC).
(The green USB led should go on)
Current status: Ok, COMbricks headstation connected and in firmware update mode.
Start update
COMbricks is connected to USB and in the update mode
Click here to browse to the .pkg file
Warning
COMbricks is restarting
DO NOT remove the power until the led animation is finished!!
(this takes approx 3 minutes)
Close
This window can be closed directly, but wait until COMbricks is ready (check LEDs)

Fig. 48 - Firmware update tool

It is also possible to update the firmware with just the USB cable. Follow the same procedure as described above. The attached modules will NOT work, but there is full access to the Head Station.

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9 Tips and Tricks

9.1 Ident Number lookup

It is possible to check if COMbricks has info on a certain Ident Number (located in gsd.bin):

[COMbricks IP or DNS address]**/data_srv.cgi?data=gsdinfo:0x**[Ident Number]

Example: *http://192.168.1.230/data_srv.cgi?data=gsdinfo:0x6012*

It should display a line comparable with this:

ABB%20**Drives**%20**NPBA**%2D12%1FABB%2DDRIVES%1F40%1F8%1FNPBA%2D12%.....

9.2 Solution for secured email connections

Because COMbricks can only handle unsecured email connections, a proxy between COMbricks email and outgoing email could be helpful. hMailserver is a free tool that creates a mail server on one of the local PCs in the network. COMbricks can mail the events to this mailserver and the mailserver can forward it through a secured connection to an external mailserver.
www.hmailserver.com

9.3 IP address adjustment tool

Every time you go 1-on-1 with a laptop to a COMbricks unit, the IP settings of your laptop have to be adjusted to fit the local IP address of the COMbricks. To make this step very a easy a tool is available with the name NetSetMan to automatically change all the settings according to customized profiles.
www.netsetman.com

9.4 Free Wi-Fi channel detector

For COMbricks streaming with the ProfiTrace 2 software over Wi-Fi, a clean connection is required to keep the streaming performance as high as possible. To verify that your Wi-Fi does not overlap with other channels, we recommend to use the free tool inSSIDer.
www.metageek.net/products/inssider

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10 Technical Data - COMbricks in general

Technical Data - COMbricks in general	
Dimensions, weight and mounting	
Dimensions H x D x W (mm) Weight DIN-rail	140 x 110 x 25 mm (1 module) 150 g 35 mm (minimal 50 mm wide)
Ambient conditions	
Operating temperature Isolation class	0..60° Celsius IP 20 (DIN 40 050)
Colours and material	
Housing Backplane DIN rail clip Side cap	RAL 5017 (blue) - ABS RAL 7037 (grey) - ABS RAL 2004 (orange) - PP RAL 7024 (anthracite) - PP

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11 Technical Data - Head Station 1A/1B/1C

Technical Data - Head Station 1A/1B/1C	
Type differences (Hardware is identical with all types)	
Head Station 1A Head Station 1B Head Station 1C	No ProfiTrace OE ProfiTrace OE for 2 PROFIBUS networks ProfiTrace OE for 4 PROFIBUS networks + ProfiTrace 2 live streaming + OPC
Backplane	
Modules Current available for the backplane PROFIBUS networks Compatible backplane units	32 (10 repeater modules positioned in the first 10 slots) 2.5 A 4 101-200023, 101-200012
Power supply specifications	
Nominal supply voltage Current consumption Power Reverse polarity protection Redundant power supply Wire diameter	10.8 .. 26.4 VDC 800 mA (fully loaded) 20 W Yes Yes < 2.5 mm^2
Ethernet	
Connector Cable length Link speed MAC address Supported protocols Default IP address after reset/purchase Connections	RJ 45 Max. 100 m 10 / 100 Mbps 9C.B2.06.xx.xx.xx (label on the side of the Head Station) HTTP, FTP, SMTP, TELNET, DHCP **192.168.1.254** 20 simultaneous web server clients
Relay contact	
Resistance Voltage Current	300 mOhm (plug included) 250 VAC 1A

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Technical Data - Head Station 1A/1B/1C	
SD Card	
Types Size	SD and SDHC Max. 32 GB (2 GB is provided)
Others	
MTBF Audio jack	To be defined Not supported yet

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12 Technical Data - 2 Channel Repeater (101-201102)

Technical Data - 2 Channel Repeater (101-201102)	
Backplane	
PROFIBUS networks Modules Power supply Current consumption Compatible backplane units	4 (set by dipswitches or web server) 10 (positioned in the first 10 slots only) Provided through the backplane ± 300 mA 101-200011, 101-200023, 101-200012
Protocol specifications	
Supported Protocols Address Transmission speed Transmission speed detection Data delay time (normal mode) Data delay time (redundant mode) Delay time jitter	DP-V0, DP- V1, DP-V2, FDL, MPI, FMS, PROFIsafe, PROFIdrive and any other FDL based protocol NO bus address required 9.6 kbps .. 12 Mbps (including 45.45 kbps) Auto detect (< 10 s detection and 50 s lost time) 1.6 TBit at 9.6 kbps .. 93.75 kbps 1.7 TBit at 187.5 kbps .. 500 kbps 1.8 TBit at 1.5 Mbps 2.0 TBit at 3 Mbps 2.75 TBit at 6 Mbps 3.75 TBit at 12 Mbps 11.6 TBit at 9.6 kbps .. 93.75 kbps 11.7 TBit at 187.5 kbps .. 500 kbps 11.8 TBit at 1.5 Mbps 12.0 TBit at 3 Mbps 12.75 TBit at 6 Mbps 13.75 TBit at 12 Mbps Max. ¼ TBit
PROFIBUS cable specifications	
Cable lengths Wire diameter (for the screw terminals) Wire type	1200 m at 9.6 kbps .. 93.75 kbps 1000 m at 187.5 kbps 400 m at 500 kbps 200 m at 1.5 Mbps 100 m at 3 Mbps .. 12 Mbps < 1.5 mm^2 Stranded or solid core

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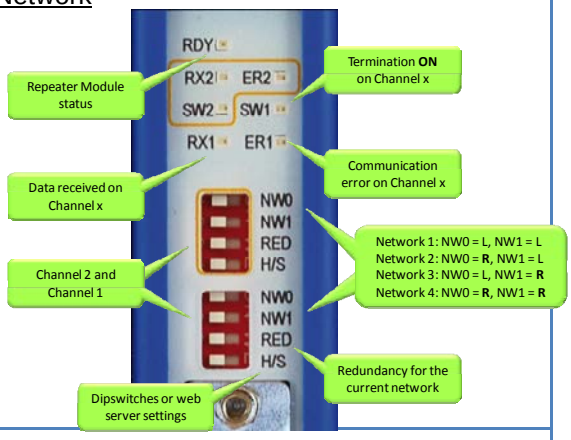
Technical Data - 2 Channel Repeater (101-201102)	
Number of devices Termination Cascading depth Redundancy	Maximum 31 devices per channel (busload) Integrated (switchable) Powered according to PB RS 485 (390/220/390 Ohms) No limit, only busparameter limitation of the master Yes, maximum 10 cables activated by switch
Dipswitches	
NW0 NW1 LEFT LEFT RIGHT LEFT LEFT RIGHT RIGHT RIGHT RED LEFT RIGHT H/S LEFT RIGHT	PROFIBUS Network 1 2 3 4 Redundancy OFF ON Settings Hardware Software 
PROFIBUS connectors	
CH2 A, B SH I CH1 A, B SH I	Screw terminals Green wire, Red wire Direct grounding Indirect grounding Screw terminals + DB9 connector (1-on-1) Green wire, Red wire Direct grounding Indirect grounding
Others	
Head Station firmware Operating temperature Weight MTBF	ALL 0 .. 60 °C ?? To be defined

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13 Technical Data - 1 Channel Repeater (101-201101)

Technical Data - 1 Channel Repeater (101-201101)	
Backplane	
PROFIBUS networks Modules Power supply Current consumption Compatible backplane units	4 (set by dipswitches or web server) 10 (positioned in the first 10 slots only) Provided through the backplane ± 200 mA 101-200011, 101-200023, 101-200012
Protocol specifications	
Supported Protocols Address Transmission speed Transmission speed detection Data delay time (normal mode) Data delay time (redundant mode) Delay time jitter	DP-V0, DP- V1, DP-V2, FDL, MPI, FMS, PROFIsafe, PROFIdrive and any other FDL based protocol NO bus address required 9.6 kbps .. 12 Mbps (including 45.45 kbps) Auto detect (< 10 s detection and 50 s lost time) 1.6 TBit at 9.6 kbps .. 93.75 kbps 1.7 TBit at 187.5 kbps .. 500 kbps 1.8 TBit at 1.5 Mbps 2.0 TBit at 3 Mbps 2.75 TBit at 6 Mbps 3.75 TBit at 12 Mbps 11.6 TBit at 9.6 kbps .. 93.75 kbps 11.7 TBit at 187.5 kbps .. 500 kbps 11.8 TBit at 1.5 Mbps 12.0 TBit at 3 Mbps 12.75 TBit at 6 Mbps 13.75 TBit at 12 Mbps Max. ¼ TBit
PROFIBUS cable specifications	
Cable lengths Wire diameter (for the screw terminals) Wire type	1200 m at 9.6 kbps .. 93.75 kbps 1000 m at 187.5 kbps 400 m at 500 kbps 200 m at 1.5 Mbps 100 m at 3 Mbps .. 12 Mbps < 1.5 mm^2 Stranded or solid core

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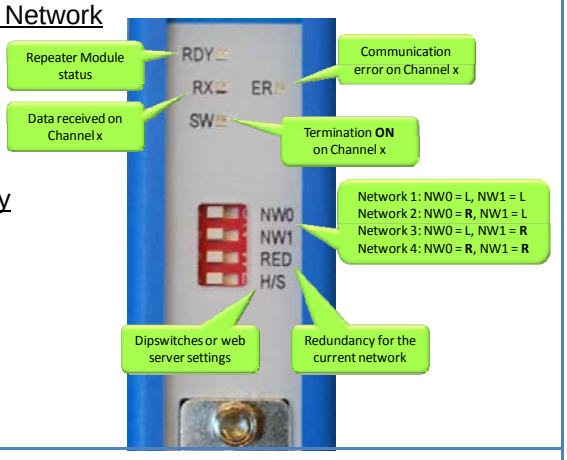
Technical Data - 1 Channel Repeater (101-201101)	
Number of devices Termination Cascading depth Redundancy	Maximum 31 devices per channel (busloads) Integrated (switchable) Powered according to PB RS 485 (390/220/390 Ohms) No limit, only busparameter limitation of the master Yes, maximum 10 cables activated by switch
Dipswitches	
NW0 NW1 LEFT LEFT RIGHT LEFT LEFT RIGHT RIGHT RIGHT RED LEFT RIGHT H/S LEFT RIGHT	PROFIBUS Network 1 2 3 4 Redundancy OFF ON Settings Hardware Software 
PROFIBUS connectors	
CH1 A, B SH I	Screw terminals + DB9 connector (1-on-1) Green wire, Red wire Direct grounding Indirect grounding
Others	
Head Station firmware Operating temperature Weight MTBF	ALL 0 .. 60 °C ?? To be defined

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14 Technical Data - SCOPE Repeater (101-201210)

Technical Data - SCOPE Repeater (101-201210)	
Backplane	
PROFIBUS networks Modules Power supply Current consumption Compatible backplane units	4 (set by dipswitches or web server) 10 (positioned in the first 10 slots only) Provided through the backplane ± 500 mA 101-200011 101-200023 101-200012
Protocol specifications	
Supported Protocols Address Transmission speed Transmission speed detection Data delay time (normal mode) Data delay time (redundant mode) Delay time jitter	DP-V0, DP- V1, DP-V2, FDL, MPI, FMS, PROFIsafe, PROFIdrive and any other FDL based protocol NO bus address required 9.6 kbps .. 12 Mbps (including 45.45 kbps) Auto detect (< 10 s detection and 50 s lost time) 2.0 TBit at 9.6 kbps .. 3 Mbps 2.75 TBit at 6 Mbps 3.75 TBit at 12 Mbps 12.0 TBit at 9.6 kbps .. 3 Mbps 12.75 TBit at 6 Mbps 13.75 TBit at 12 Mbps Max. ¼ TBit
Oscilloscope specifications	
Frequency Resolution Differential range	192 MS/s 50 mV -6.436 .. 6.436 V

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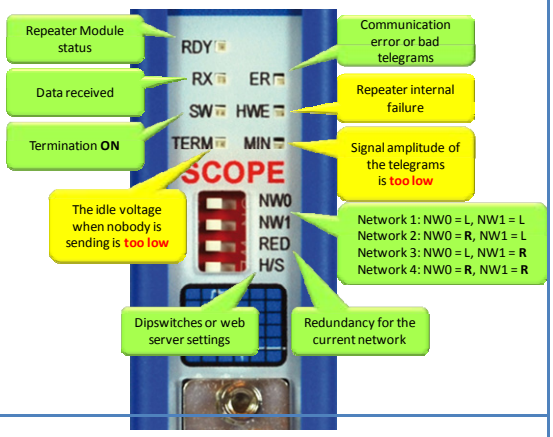
Technical Data - SCOPE Repeater (101-201210)	
PROFIBUS cable specifications	
Cable lengths	1200 m at 9.6 kbps .. 93.75 kbps 1000 m at 187.5 kbps 400 m at 500 kbps 200 m at 1.5 Mbps 100 m at 3 Mbps .. 12 Mbps
Wire diameter (for the screw terminals) Wire type	< 1.5 mm^2 Stranded or solid core
Number of devices	Maximum 31 devices per channel (busloads)
Termination	Integrated (switchable) Powered according to PB RS 485 (390/220/390 Ohms)
Cascading depth	No limit, only busparameter limitation of the master
Redundancy	Yes, maximum 10 cables activated by switch
Dipswitches	
NW0 NW1 LEFT LEFT RIGHT LEFT LEFT RIGHT RIGHT RIGHT RED LEFT RIGHT H/S LEFT RIGHT	PROFIBUS Network 1 2 3 4 Redundancy OFF ON Settings Hardware Software 
PROFIBUS connectors	
CH1 A, B SH I	Screw terminals + DB9 connector (1-on-1) Green wire, Red wire Direct grounding Indirect grounding

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Technical Data - SCOPE Repeater (101-201210)	
LEDs	
RX SW HWE ER MIN TERM	Receiving telegrams (blinking) Termination ON Internal repeater error (contact PROCENTEC) No or bad telegrams detected Signal amplitude of the telegrams too low (< 2.5 V) Idle voltage too low (< 1 V)
Others	
Head Station firmware Operating temperature Weight MTBF	At least version 1.260 0 .. 60 °C 120 g To be defined

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15 Technical Data - 4 CH Relay Module (101-210210)

Technical Data - 4 Channel Relay Module (101-210210)	
Backplane	
Controllers	Web server, PROFINET IO device, PROFIBUS DP slave
Modules	32 (all slots)
Power supply	Provided through the backplane
Current consumption	± 225 mA
Compatible backplane units	101-200011, 101-200023, 101-200012
Relays	
Relays	4
Current	5 A per relays
Voltage	230 VAC
Resistance	300 mOhm (including connectors)
Toggles	100000 (at 5A - 230 VAC)
Connectors	
Pins	1 = No (normally open) 2 = Common 3 = Nc (normally closed)
Wire diameter (for the screw terminals)	< 2.5 mm^2
Wire type	Stranded or solid core
Others	
Head Station firmware	V1.260 and later
Dimensions	140 x 110 x 25 mm
Operating temperature	0 .. 60 °C
Weight	125 g
MTBF	To be defined

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16 Technical Data - 8 CH D-out Module (101-210110)

Technical Data - 8 Channel Digital Out Module (101-210110)	
Backplane	
Controllers Modules Power supply module electronics Power supply digital outputs Current consumption module electronics Compatible backplane units	Web server, PROFINET IO device, PROFIBUS DP slave 32 (all slots) Provided through the backplane Provided through an additional 3-pin connector ± 290 mA 101-200011, 101-200023, 101-200012
Digital Outputs	
Outputs Current Voltage range Losses	8 DOs on 1 connector 0.5 A per DO (direct current) 15..30 VDC (depends on provided voltage) 0.211 Ohm loss per DO
Power Connector	
Pins power connector Wire diameter (for the screw terminals) Wire type	1 = -, 2 = +, 3 = SH < 2.5 mm^2 Stranded or solid core
Digital Output Connector	
Pins DO connector Wire diameter (for the screw terminals) Wire type	1 = GND, 2..9 = DO0..DO7, 10 = GND < 1.5 mm^2 Stranded or solid core
Others	
Head Station firmware Dimensions Operating temperature Weight MTBF	V1.260 and later 140 x 110 x 25 mm 0 .. 60 °C 105 g To be defined

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17 Frequently asked questions / FAQ

General

Are the Kits in the product list really required?
NO, the Kits are just an easy step into the COMbricks world, because they contain all required components. You can also order all items separately; Head Station, repeater modules, I/O modules, etc. Kits are also cheaper than separate items.

Backplane

How many modules can I insert in the backplane?
COMbricks can handle 32 modules which can be of any type, but high speed modules can only be inserted in the first 10 sockets (repeater, slave and fibre optic modules). If you only have 5 high speed modules, the rest of the sockets can be completed with regular modules (I/O modules).

What is the "Backplane Network"?
These are the 4 internal networks on the backplane that repeater modules utilize to transfer PROFIBUS messages transparently to other inserted repeater modules who are locked to the same network number. Each network can have its own masters, slaves and baudrate. They are completely isolated.
http://www.youtube.com/watch?v=P3_gSC1pJO4

When I buy a module of any type, is a backplane socket provided?
YES, with every module a backplane socket is provided. If you require more sockets because of spare parts, an additional set can be purchased.

Installation

What is the default IP address after purchase or reset?
The default IP address is; **192.168.1.254**. This can be customized through the web server of the Head Station or the COMbricks Discovery Tool.

ProfiTrace

Do you need a constant PC connection to monitor the network?
NO, This is a great feature for permanent monitoring. COMbricks contains a kernel and web server that works independently directly after power-up. Updates of the Live List, Statistics, Logging, Emailing, etc. are all carried out on its own initiative and can always be viewed.

Do I need to install monitoring software?
NO, COMbricks is based on a web server. For the basic operation you only need a web browser. The advantage is that you will not have compatibility problems with operating systems.

What is the difference between ProfiTrace OE and regular ProfiTrace?
OE stands for "Over Ethernet". It is the ProfiTrace core in COMbricks which visualizes all the information in a web server. The biggest difference is that ProfiTrace OE is permanently monitoring the installation and it does not require a constant PC connection.

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Where does it save monitoring data, logs and settings?
The Head Station contains a uSD card on which all information is stored. By means of the web server or FTP the user can inspect and download the information. He can of course also take out the SD card and insert it in a PC.

What is 'live data streaming' with ProfiTrace 2?
Head Stations 1B and 1C have an integrated ProfiTrace that can be accessed with a web browser. The integrated ProfiTrace has some graphical and functional limitations compared to the powerful ProfiTrace 2 software. Live data streaming is a function within ProfiTrace that makes a connection with COMbricks over Ethernet and acts as if it works with a ProfiCore. The user can now use all the functionality of ProfiTrace 2 with the protocol data of 2 or 4 networks that COMbricks is capturing (Live List, statistics, message recording, triggering, searching, etc).

We already have repeaters installed. How can we take advantage of COMbricks without disturbing the existing network?
You can connect 1 channel of a COMbricks repeater module as a regular bus participant. Like a ProfiCore and ignoring the repeater functionality. Once a repeater channel is in contact with the cable/communication, ProfiTrace monitors telegrams.

How many files does the automatic message recording triggering save?
The automatic triggering saves 10 files per network. Each file has its own name. When a new trigger takes place after 10 files have already been saved, the oldest file is replaced by the new one (ring recording).

Repeater modules

Are the COMbricks repeaters suitable for PROFIsafe networks?
YES, especially in combination with the repeater redundancy makes COMbricks a perfect infrastructure component for PROFIBUS safety networks. Remote maintenance with ProfiTrace OE only makes it better.

Can COMbricks be used in MPI networks?
YES, MPI is using PROFIBUS FDL telegrams with its own user data implementation. Every COMbricks repeater and fibre optic coupler can interpret and forward MPI telegrams. Also the cabling rules are the same for MPI.

How are repeater modules powered?
All power is distributed over the backplane by the Head Station. The power to the Head Station is provided by 24V power connectors (redundant option).

How can I remotely deactivate a repeater module during operation?
Officially there is no shutdown function. What you can do is set the repeater network number by software (web server) instead of dipswitches. When you want to shut it down, change the assigned network number to a number that is not used. This will cause the repeater to be isolated from the rest.

With a Head Stations 1B (ProfiTrace for 2 networks) can I still wire 4 networks divided over 10 repeater modules?
YES, ProfiTrace OE on a 1B Head Station will monitor network 1 and 2. There is no link with the repeater modules which can be set to network 1, 2, 3 and 4.

I have changed the dipswitches on the repeater modules. How can I actualize them in the system without removing the power on the Head Station?
You can soft start the system with the nav button on the Head Station or in the Device Management

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menu of the web server. It is also possible to remove and insert the respective module.

When a slot contains a 1 channel repeater module can I hot swap it with a 2 channel repeater module?
YES, every time a module is inserted it is configured without looking at the past.

Is a 2 channel repeater module the same as a regular repeater?
YES and NO, Of course you have 2 RS 485 sides like a regular repeater, but there is a 3rd channel going to the backplane to link up with the other inserted repeater modules. This means a 2 channel repeater module can also be compared with a 3 channel repeater, but the 3rd channel is not RS 485. Additional to this; the RS 485 channels can also be assigned to networks. Then it cannot be compared at all with a regular repeater.

Is there an overview available how to connect the PROFIBUS cable with the repeater modules and when to switch on the on-board termination?
This image illustrates the 4 configurations that we support:
http://www.procentec2.com/pics2/0009.jpg

In configuration A and C the cable starts at the repeater module. In configuration B and D the repeater module is in the middle of the cable.

Only in configuration A the on-board termination should be set to ON. With the other configurations the repeater module is in the middle of the segment or the termination is activated on the DB9 plug.

For the latest FAQ list check out our website!

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19 Products and spare parts

Component	Order code	Remarks
SCOPE Kit Monitoring 2 networks	101-200Q1D	• Head Station type 1B • SCOPE repeaters 2x • Fixed backplane unit
SCOPE supreme Kit Monitoring 4 networks	101-200Q1E	• Head Station type 1C • SCOPE repeaters 2x • 2CH repeater • Fixed backplane + single backplane unit
Basic Kit Monitoring 2 networks	101-200Q1B	• Head Station type 1B • 2CH repeater • Fixed backplane unit
Supreme Kit Monitoring 4 networks	101-200Q1C	• Head Station type 1C • 2CH repeaters 2x • Fixed backplane unit
Head Station Type 1C	101-20011C	**- ProfiTrace OE on 4 networks** - 2 GB SD card - Ethernet port - Redundant power supply - Drives 32 modules - CommDTM - Backplane unit **- Streaming in ProfiTrace 2** **- OPC in ProfiTrace 2**

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Component	Order code	Remarks
Head Station Type 1B	101-20011B	**- ProfiTrace OE on 2 networks** - 2 GB SD card - Ethernet port - Redundant power supply - Drives 32 modules - Backplane unit
Head Station Type 1A	101-20011A	**- Basic web server** - 2 GB SD card - Ethernet port - Redundant power supply - Drives 32 modules - Backplane unit - **NO ProfiTrace OE**
SCOPE Repeater	101-201210	- 1 RS 485 channel repeater with oscilloscope - Same specs as regular 1 channel repeater - 192 MS/s sample rate - 50 mV resolution - -6.436..6.436 V - Backplane unit included
2 Channel Repeater	101-201102	- 2 RS 485 channels - 12 Mbps - 31 devices per channel - Screw terminals - DB9 connector - Redundancy - Termination - Backplane unit included
1 Channel Repeater	101-201101	- 1 RS 485 channel - 12 Mbps - 31 devices per channel - Screw terminals - DB9 connector - Redundancy - Termination - Backplane unit

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Component	Order code	Remarks
4 Channel Relay Module	101-210210	- 5 A - 230 VAC
8 Channel Digital Out	101-210110	- 0.5 A - 24 VDC
Fixed Backplane 3 Modules	101-200023	- Fits: 1 Head Station and 2 regular modules - Extendible with standard backplane units - Improved durability
Fixed Backplane 2 Modules	101-200012	- Fits: 1 Head Station and 1 regular module - Extendible with standard backplane units - Improved durability
Backplane Units 5-pack	101-200011	- Pack of 5 pieces - Suitable for all regular modules - **NOT for Head Stations**

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20 Glossary

Address	Unique number of a device connected to the network. With PROFIBUS this can be 0 to 126. 127 is a broadcast address.
Analyzer	Software tool to observe the protocol traffic. Combi-Analyzers can also inspect the signal quality. Other term: Bus Monitor. Example: ProfiTrace.
Bit Time (TBit)	To help simplify timing calculations, it is convenient to normalize the time units. One Bit Time is the time it takes to transmit one bit and is the reciprocal of the baudrate and is calculated as follows; TBit = 1 (bit) / baudrate (bps). Examples: 12 Mbps --> TBit = 83 ns 1,5 Mbps --> TBit = 667 ns
C	Capacitance.
Class 1 master	A class 1 master is normally a PLC or DCS system. The class 1 master handles the cyclical Data Exchange with the slaves assigned to it.
Class 2 master	A class 2 master is usually a laptop or programming console that is provided for commissioning, maintenance or diagnostic purposes.
Data Exchange	The state of a slave after parameterization and configuration has been completed, in which it cyclically exchanges I/O data with the master. Normally the slave stays forever in Data Exchange until the bus communication or device are stopped.
DGND	Digital Ground.
DIN	German Institute for Standardization (www.din.de).
DNS	Domain Name Service When COMbricks is sending an e-mail, it uses a DNS server to look up the domain name it is trying to access and convert it to an IP address. COMbricks uses a default DNS server, but if your email server does not support this one, you can enter an alternative DNS server.
DP-V0	DP-V0 is the basic stage of the PROFIBUS DP communication protocol. DP-V0 devices (master and slaves) perform the following basic functionalities: - Cyclic exchange of I/O data between controlling and slave devices - Device, Identifier (module) and Channel related Diagnosis - Parameterization of DP-slaves - Configuration of DP-slaves

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DP-V1	DP-V1 is the first extension of PROFIBUS DP-V0. DP-V1 devices comply with the following features: - Device related diagnosis is replaced by status and alarms. - The first three octets of the user parameterization data are standardized. Optionally these devices may support: - Acyclic communication (MS1, MS2). - If alarms are used, MS1 is supported.
DP-V2	DP-V2 is the second stage of extension of PROFIBUS DP after DP-V1. DP-V2 devices shall comply with the following features: - Data Exchange Broadcast (DxB) for slave to slave communication (publisher/subscriber principle). - Isochronous Mode (time tick synchronized operating slaves, e.g. drives) - Up- and/or download of Load Region Data (domains) - Clock Control (synchronization within slaves) and Time Stamping - Redundancy.
Drop cable	See *Spur line*.
Electromagnetic Compatibility	See *EMC*.
EMC	The extent to which an electric or electronic device will tolerate electrical interference from other equipment (immunity), and will interfere with other equipment. Within the European Community as well as in other countries it is regulated by law that electric and electronic components and equipment comply with basic standards such as IEC 61000-6-2 or IEC 61326 or corresponding individual product standards.
FDL	Fieldbus Datalink Layer. Layer 2 of PROFIBUS.
Flashing	Function in the Discovery Tool that will blink the LEDs of a selected COMbricks. Flashing is a support feature that gives the user a visual confirmation about the installed location of the COMbricks.
FTP	File Transfer Protocol Allows a user to transfer files between two computers. The FTP client program runs on one computer and a server program on the other. FTP is primarily for transferring files but can be used to perform other functions: creating directories, removing directories, listing files, etc. It is TCP based.
GSD file	Generic Station Description. It is provided by the device manufacturer and contains a description of the PROFIBUS DP/PA device. GSD files provide a way for an open configuration tool to automatically get the device characteristics.
Head Station	The Head Station is the primary element of COMbricks and has to be inserted in the most left slot of the fixed backplane socket. It schedules the interaction between all modules and provides data storage and an Ethernet interface for the user.

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HSA	Highest Station Address The highest address to which the master will look for new masters. This is done with the FDL Status message. It has nothing to do with the configured slaves! Default value is 126, but the end user can decrease it to a lower value. We recommend leaving it on 126 in order to display not configured slaves in the Live List. This value does not influence the I/O cycle time of the network.
Hub	A Hub refreshes a signal and passes the information on to all nodes which are connected to the Hub. Data frames which were received on one port are transferred to all the other ports (chicken foot topology).
Ident Number	The primary slave device identification is an Ident Number. This is a unique 16 bits number assigned by the PNO. It is stored within the device and defined in the corresponding GSD file. In addition it is part of the GSD file name. At runtime the Ident Number is used within the; - Set slave address procedure - Parameterization telegram (byte 5 + 6) - Standard part of a diagnosis message (byte 5 + 6) The Ident Number can be retrieved from a device. Its main purpose is to make sure that a GSD file and configuration/parameterization data between master class 1 and its slave are matching.
Live List	The Live List is a matrix that lists all the available devices. It is directly visible which devices are 'troublemakers'. With different background colours the status of the devices is displayed. The Live List can also generate the product name of the devices when a diagnostic message is captured (synchronized with the GSD library).
Module	A card that can be inserted in the backplane of COMbricks. Examples of modules: repeaters, DP slaves or I/O cards.
MPI	Multiple Protocol Interface. Protocol defined by Siemens which uses the layer 1 and 2 of PROFIBUS (FDL).
OE	*See ProfiTrace OE.*
PA	*See PROFIBUS PA.*
PB	PROFIBUS.

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PROFIBUS DP	Acronym for "PROFIBUS for Decentralized Peripherals". Specification of an open fieldbus system with the following characteristics: - Polling master-slave-system (cyclic communications, MS0) - Flying masters with robin round token passing coordination (MM) - Connection based (MS1) and connectionless (MS2, MS3) acyclic communication between masters and slaves Options (e.g.): - Data exchange broadcast (DXB), i.e. slave to slaves communication - Isochronous mode of slaves - Clock synchronization - Redundancy PROFIBUS DP is standardized within IEC 61158 and IEC 61784, communication profile families 3/1 and 3/2 The term "PROFIBUS DP" also is a synonym for the RS485 based deployments within factory automation.
PROFIBUS PA	Acronym for "PROFIBUS for Process Automation". This is an application profile based on PROFIBUS DP independent from the physical profiles (RS485, Fiber Optics, MBP). The requirements of continuous manufacturing are covered within the application profile "PA-Devices" and the extension MBP to the physical profiles.
ProfiTrace OE	ProfiTrace Over Ethernet. A ProfiTrace core which has been implemented in COMbricks that permanently monitors the installation through the repeaters and visualizes the information in a web server.
Reflection	Part of the original signal that is transmitted back along the cable. It corrupts the original signal.
Repeater	Active physical layer device that receives and retransmits all signals over a different port to increase the distance and number of devices for which signals can be correctly transferred for a given medium.
SD card	Secure Digital (SD) is a non-volatile memory card format developed by the SD Card Association for use in portable devices, like: cameras, phones and game players. The SDHC (High-Capacity) card family has a capacity of 4 GB to 32 GB.
Spur line	A cable attached to a bus segment with a T-connection . Spurs are not recommended with PROFIBUS DP. They are prohibited with 12 Mbps and PROFIsafe operations. German term is "Stichleitung".
Stub line	See *Spur line*.
TBit	*See Bit Time.*

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TELNET	TELetype NETwork Is a network protocol used to make raw-TCP sessions (terminal-like access). Basically keyboard commands typed by a remote user can cross the network and become input for the server. On many operating systems the TELNET client program is available to communicate without specialized client software. It was developed in 1969.
Termination	A (powered) resistor network at both ends of a segment to prevent reflections (with PROFIBUS DP the termination has to be powered).
Topology	In a communications network, the pattern of interconnection between network nodes; e.g. bus, ring, star configuration.

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21 About PROCENTEC

PROCENTEC is an independent company, concentrating all its products and services on PROFIBUS and PROFINET technology. Our main business is the export of in-house developed automation products through our worldwide distributor network. PROCENTEC is also providing vendor independent training and support to end-users.

We are an international PROFIBUS and PROFINET Competence/Training Center with all the required expertise available to realize our projects and services. We have the availability of some real experts whose knowledge makes us unique in the world. Because of our international recognition we are often contracted and offer a wide range of commercial services (consultancy, training, commissioning, maintenance and troubleshooting). PROCENTEC has 2 offices; the headquarters is based in The Netherlands and a sales office is located in Germany.

Testlab
PROCENTEC runs 1 of the 8 accredited test laboratories for the certification of PROFIBUS devices. In our laboratory vendors can have their products tested on PROFIBUS compatibility.

Product development and export
We develop in house PROFIBUS and PROFINET products that are being exported through our worldwide distributor network. Especially in the area of maintenance tools we have gained a unique market position.

Democenter
We have a demonstration facility, which is used for support, training, demonstrations, engineering and trade fairs. It consists of more than 250 devices from more than 40 vendors.

Training and Education
PROCENTEC is very successful with its training program. Up to now, more than 4000 participants have received a certificate. The costs incurred for engineering, assembly, commissioning and maintenance always play a key role when choosing a fieldbus. We train our participants that the implementation of PROFIBUS and PROFINET can help to cut costs in all areas. Our practical experience is the key factor! PROCENTEC offers different types of PROFIBUS and PROFINET training modules which are organised on a regular basis.

PROCENTEC is a professional organisation, which is involved in PROFIBUS and PROFINET technology 24-hours a day. It has the availability of experts who are constantly deployed worldwide. Not only is the tried and tested automation technology ideal for the use in both Factory and Process automation, but support is also ensured through the products and services of PROCENTEC.

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22 Certificates

Certificate of Compliance

This certificate is issued under the conditions as described in the test report as mentioned below

Certificate number:	**10C01036CRT02**
Product name:	**COMbricks**
Model number:	**--**
Serial number: (Product identification)	**COMbricks head station: SN203, COMbricks 2Ch Repeater: SN101**
Manufacturer:	**Procentec Turfschipper 41 2292 JC WATERINGEN The Netherlands**
Measurements carried out on behalf of:	**Procentec Turfschipper 41 2292 JC WATERINGEN The Netherlands**
Applicant's representative:	**Mr. M. de Brabander**
In the capacity of:	**Manufacturer**
Date of measurement:	**2010 November, 4,5**
The measurement results are laid down in report:	**10C01036RPT02**
The product has been examined according to [1]:	**Emission: EN 55022 (2006) + A1 (2007), class A** **Immunity: EN 55024 (1998) + A1 (2001) + A2 (2003)**

D. van der Vlugt
Director

Woerden, 2011 March, 15

[1] *Has been found in compliance with the harmonised standards under the EMC directive 2004/108/EC.*

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The Standard for EMC- & Radio, Automotive and Electrical Safety

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This certificate is issued under the conditions as described in the test report as mentioned below

Certificate number:	**10C01037CRT02**
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Model number:	**--**
Serial number:	**COMbricks head station: SN203,**
(Product identification)	**COMbricks 2Ch Repeater: SN101**
Manufacturer:	**Procentec Turfschipper 41 2292 JC WATERINGEN The Netherlands**
Measurements carried out on behalf of:	**Procentec Turfschipper 41 2292 JC WATERINGEN The Netherlands**
Applicant's representative:	**Mr. M. de Brabander**
In the capacity of:	**Manufacturer**
Date of measurement:	**2010 November, 4,5**
The measurement results are laid down in report:	**10C01037RPT02**
The product has been examined according to [1]:	**Emission: 47 CFR 15, class A**

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Date of issue	11-08-2010
Valid until	11-04-2013
Certificate number	NL 5147

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(Jörg Freitag, Chairman)

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PI PROFIBUS • PROFINET

Certificate

Authorization as PI Test Laboratory for PROFIBUS

PROFIBUS Nutzerorganisation e.V. accepts
PROCENTEC
Turfschipper 41
2292 JC Wateringen
The Netherlands

as authorized PI Test Laboratory for:

PROFIBUS Slave Devices

PA Profile Devices

The authorization is based on the assessment dated March 4, 2011, and the related assessment report.

The execution of the tests aimed in the PROFIBUS certification shall be conform to the PROFIBUS Standard and the valid guidelines.

This authorization is valid until December 31, 2012.

(Official in Charge)

Board of PROFIBUS Nutzerorganisation e. V.

(J. Freitag) (K.-P. Lindner)

PROFIBUS®

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23 Revision history

Version 1.5.0 - NEW paragraph on ProfiTrace 2 streaming - Updated the "Web server" chapter
Version 1.6.0 - Updated the "Web server" chapter - Updated the "Head Station" chapter - Updated the "FAQ" chapter - Updated the "Quick start" chapter
Version 2.0.0 - NEW paragraph "Email setup" (Web server chapter) - NEW paragraph "Event setup" and "GSD lib update" (ProfiTrace OE chapter) - NEW paragraph "Statistics explanation" (ProfiTrace OE chapter) - NEW paragraph "EMC barrier" (Repeater chapter) - Updated the "Quickstart" chapter - Updated the "Glossary" - Updated the "Tips and Tricks" - Updated the "Distributors"
Version 3.0.0 - Updated the "Head Station" chapter (comparison table, relay contact) - Updated the "Repeater" chapter (SCOPE repeater) - Updated the "Distributors" - Updated the "Technical Data" - Updated the "Product list" - Updated the "Product description" chapter - Updated the "Web server" chapter - Updated the "FAQ" chapter - Updated the "Quick Start" chapter - Updated the "ProfiTrace OE" chapter
Version 3.1.0 - Updated the "Certificate" chapter - Updated the "Technical Data" chapter - Updated the "Installation instructions" chapter - wiring repeater modules - Updated the "ProfiTrace OE" chapter - streaming with ProfiTrace 2 - Updated the "FAQ" chapter - Updated the "Product description" chapter - Updated the "Product and Spare part list" chapter - Updated the "Tips and Tricks" chapter

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24 Next versions

Installation
- Commissioning (channel list, module status, LEDs)
- Technical drawings of the COMbricks

Tips and Tricks
- Modifying system.ini

New chapters
- Backplane structure
- Commissioning — Checklist; Channel list, LEDs, Backplane current
- Training — (Discovery tool, Reset, Removing modules, Setting remote information, Setting IP Address, Email)

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25 Notes

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Other PROCENTEC products

PROFINET Cable Tester

- ✓ Suitable for 4- and 8-wire PROFINET and regular Ethernet cables
- ✓ Suitable for straight and 90°, metal or plastic PROFINET plugs
- ✓ Tests cable shielding
- ✓ Detects short circuits, wire breaks, swaps, miswiring and split pairs
- ✓ Large LCD clearly indicates the test results
- ✓ 150 hours on one 9 V battery
- ✓ Operating temperature: 0 to 50 °C
- ✓ Just 1-key-press to start continuous testing
- ✓ It can also test telephone and coax cable

www.profinetcabletester.com

Compact PROFIBUS Repeater

- ✓ Single channel PROFIBUS repeater
- ✓ Transparent
- ✓ Increased signal strength
- ✓ 12 Mbps
- ✓ Auto baudrate detection
- ✓ Redundant power supply
- ✓ Digital glitch filtering
- ✓ No limit in cascading
- ✓ Integrated switchable termination
- ✓ Diagnostic LEDs
- ✓ DB9 connector for measurements
- ✓ **IP 20 with DIN-rail mounting**

www.procentec.com/profihub/b1/en

Other PROCENTEC products

ProfiHub B5

- ✓ 5 Isolated channels
- ✓ Transparent
- ✓ Increased signal strength
- ✓ 31 devices per channel
- ✓ 12 Mbps
- ✓ 1200 m spur line length
- ✓ No address required
- ✓ Integrated switchable termination
- ✓ LEDs to indicate termination is ON
- ✓ Screw terminals and DB9 connectors
- ✓ IP 20 with DIN-rail mounting

ProfiHub A5

- ✓ 5 Isolated channels
- ✓ Transparent
- ✓ Increased signal strength
- ✓ 31 devices per channel
- ✓ 12 Mbps
- ✓ 1200 m spur line length
- ✓ No address required
- ✓ Integrated switchable termination
- ✓ IP 65 classification

www.procentec.com/profihub

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